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IN THIS ISSUE

DATA on illnesses among subscribers to a pre-paid medical care plan in Windsor, Ontario, Canada were utilized for the article "A Short-Term Longitudinal Morbidity Investigation" by John R. Smiley, Carol Buck, and G. E. Hobbs. Prevalence rates for all illness and for specific diagnoses in one month (April) are compared for adults who were ill and those who were not ill in the previous January. Higher prevalence rates are found for the previously ill than for the not-ill group, both for men and women. The authors have classified the illnesses according to a psychosomatic code and show that a significant excess rate occurred among the previously ill persons for definite psychosomatic illness and for organic disease but not for accidents. Possible factors associated with illness liability are discussed and suggestions made for further study.

• • •

The effect of nutritional supplementation of the mother's diet during pregnancy upon the physical status of her infant at birth and its growth during the first months of life is explored in an article based upon the experience of patients at the Nutrition Clinic of Pennsylvania Hospital in Philadelphia. In this report by Richard V. Kasius *et al*, "Size and Growth of Babies of Mothers Receiving Nutrient Supplements," no real relationship is noted between the supplements taken by the mothers and the size and growth of their infants. However, the infants of women receiving the vitamin supplement tended to be a little lighter at birth than the other infants, and implications of this finding are discussed in the article.

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In a previous issue of the *Quarterly* Robert G. Potter, Jr., and John F. Kantner presented an article for the Indianapolis Study Series on the relationship of family size in two successive generations. To some extent this was an analysis of the influence of the cultural influence of parents on the fertility of their offspring. They have an article in the present issue entitled "The Influence of Siblings and Friends on Fertility." This is the twenty-eighth of the series of Indianapolis Study articles bearing the general title "Social and Psychological Factors Affecting Fertility."

• • •

A paper "Some Demographic Measurements for Egypt Based on the Stability of Census Age Distributions" is presented by Dr. M. A. El-Badry, of the Faculty of Cairo University and currently engaged in research at Princeton University under a Population Council fellowship. The author states "It is the purpose of this paper to utilize the near stability of the Egyptian age distributions from 1907 to 1947 to obtain a life table and certain other measures of mortality and fertility." The paper not only furnishes substantive data for Egypt but it also affords a technique which may be applicable to other underveloped areas lacking good vital statistics but having a history of approximately stable fertility and mortality, and an absence of migration across national boundaries.

A SHORT-TERM LONGITUDINAL MORBIDITY INVESTIGATION

JOHN R. SMILEY, PH.D.; CAROL BUCK, M.D., PH.D., D.P.H.; AND G. E. HOBBS, M.D., M.P.H.[1]

IN the epidemiological study of sickness, the trend has been to classify the population at risk in terms of socio-economic variables. Recently, with the development of longitudinal morbidity studies, there has been an attempt to classify the population in terms of its previous illness experience. This development introduces two major problems. The first, which arises in any morbidity study but is particularly serious in this new approach, is the question of the accuracy of the diagnosis available for analysis. It is certain that the diagnosis of illness, even when made by a physician and supported by all the modern laboratory aids, is less precise than the diagnosis of cause of death. To what extent the errors made in individual cases influence the validity of data for a large group of patients has still to be determined.

The second problem involved in the longitudinal type of study is that of classification. The existing diagnostic classifications were designed to group together illnesses which have some common basis. In the longitudinal study it is desired to group together patients who have in common a certain pattern of morbidity and who may, on this account, differ in their future illness experience. A classification which attempted to identify psychoneurotic patients would appear to hold considerable promise. A beginning in this direction has already been made by Downes and Simon (2) who compared the illness experience of psychoneurotic persons with that of their total sample population.

This Department, with access to records of a pre-paid medical care plan,[2] has been interested in this aspect of morbidity

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[2] Windsor Medical Services, Incorporated, hereinafter designated as W.M.S.

(Continued on page 214)

research for some time and has proceeded with a short-term pilot investigation in which the illness experience for one month was analysed in terms of the sickness experience of the population in a previous month. The comparison of the two primary groups, those ill and those not-ill in the previous month, forms the subject of this paper. Therefore, in this preliminary analysis the problem of accurately classifying the patients is not involved.

Methods

Because, as mentioned in a previous paper (5), our morbidity data were derived from the W.M.S. monthly medical account cards (Hollerith card), it was difficult to obtain a continuous record of the medical experience of one group of subscribers over any appreciable time-period. The difficulty was partially solved by collating, with I.B.M. equipment, the account cards of separate months in such a way as to draw together all the cards for one subscriber. Four months spaced at quarterly intervals through the year 1951 were chosen for this study, the first two of which, January and April, have been completed. The medical data from each card for each subscriber were transferred to a summary Hollerith card. By a single listing of these cards it was possible to observe the illness experience for patients ill in both January and April, and for those ill in January or in April alone. In this manner, two cross-sectional morbidity studies were converted into a short-term longitudinal study.

The subscriber population of January, 1951, was classified according to illness experience in that month. This paper is confined to a comparison of the two primary classes, the Ill and the Not-Ill in January, in terms of their illness experience in April.[3] The January data were thus used solely for the purpose of classification of the population and the April data, for comparison of morbidity experience.

which is a medical care plan in Windsor, Ontario, Canada, owned and operated by physicians who practice on a fee-for-service basis. The subscriber population of over 90,000 members works in industry and business primarily.

[3] Illness experience is expressed as monthly prevalence, not incidence. April confinements are excluded.

In dividing the W.M.S. population of January, 1951, into two classes, the Ill and the Not-Ill, a patient who received only preventive services in January was assigned to the Not-Ill class. Females who were confined in that month were excluded. Unfortunately, it was not possible to recognize among the persons ill in April, 1951, those who joined the scheme after January 31, 1951. Since the W.M.S. subscriber population increased by some nine per cent during the three-month interval, there were illnesses recorded in April which were improperly ascribed to the Not-Ill class. This inaccuracy could not be avoided, but at least it provided a bias against the hypothesis that the Ill would have higher rates of new illnesses in April than the Not-Ill.

Within the Ill class our attention was restricted to illnesses of a different nature in the same patient in April. The term "new illness" is used in this same sense throughout this paper. Thus, all diagnoses in April which suggested continuation of an illness experienced in January were excluded. In both the Ill and the Not-Ill classes, obvious variations of the same diagnosis in April were treated as one illness. For example, if a patient were treated in April for dyspepsia and peptic ulcer, the latter diagnosis was taken and only one illness recorded. As a result, there may have been an under-estimation of the true number of illnesses in April, particularly for the Ill class.

The comparison of April illness rates was made in terms of two diagnostic morbidity codes which were developed during previous studies,[4] the Psychosomatic Code (P-Code) and the System Code (S-Code), both of which have been related to the International Statistical Classification[4] in terms of its three-digit code numbers.

The Psychosomatic or P-Code divides the illnesses into six broad categories: P-1, Definite Psychosomatic; P-2, Probable Psychosomatic; P-3, Possible Psychosomatic; P-4, Definite Organic; P-5, Accidents; and P-0, Indefinite Psychosomatic.[5]

[4] By a panel of five physicians.

[5] Called Indefinite Etiology in Figures 2a. and 2b.

1 Definite Psycho-somatic	2 Probable Psycho-somatic	3 Possible Psycho-somatic	4 Organic	5 Accident	0 Indefinite Psycho-somatic
300–326	354	240–245	All	800–996	779
790	369	293	other		788
	541	395	code		793
	544	402	numbers		795
	552	433			
	573	444			
	577	467			
	708	585–586			
	784	605			
	791	616			
		632			
		634–635			
		725–726			
		780			
		782			
		786			

Table 1. Summary of the distribution of international three-digit code numbers by psychosomatic code groups.

P-1 comprises illnesses for which the physician, rightly or wrongly, made a definite diagnosis of psychoneurosis. P-4 includes illnesses with clear-cut organic diagnoses. In P-0 were placed those illnesses given such a vague description that classification was not justified. Thus in these three groups of the P-Code and in P-5 (Accidents) little in the way of difficult judgement was involved. The question of the accuracy of the original diagnoses has already been discussed.

Needless to say, all the diagnoses did not fall into such straightforward categories. There were many conditions which could not be placed in the two extremes of the organic-functional spectrum. In some, the diagnosis represented a disease considered to have emotional factors in its development, e.g.: duodenal ulcer. In others, the diagnosis was one which is frequently used to label ill-defined symptoms which may have an emotional basis, e.g.: hypotension. Where it was felt that emotional factors were probably significant, the diagnosis was allocated to P-2 (Probable Psychosomatic). Where this was still possible, but less certain, the diagnosis was allocated to P-3

Int. Code	Diagnosis	No. of Cases
	P-Code 1: Definite Psychosomatic	
790	Nervousness and Debility	168
310	Anxiety Reactions without Mention of Somatic Symptoms	137
318	Psychoneurotic Disorders, Other, Mixed and Unspecified Types	68
317	Psychoneurosis with Symptoms Affecting Other Systems	14
316	Psychoneurosis with Symptoms Affecting the Digestive System	13
	P-Code 2: Probable Psychosomatic	
544	Disorders of Function of Stomach	104
784	Symptoms Referable to Upper Gastro-Intestinal Tract	95
573	Functional Disorders of Intestines	85
543	Gastritis and Duodenitis	82
354	Migraine	44
708	Pruritis and Related Conditions	14
	P-Code 3: Possible Psychosomatic	
293	Anemia Unspecified	297
444	Essential Benign Hypertension without Mention of Heart	243
634	Disorders of Menstruation	236
726	Muscular Rheumatism	232
240	Hayfever	209
635	Menopausal Symptoms	205
241	Angioneurotic Oedema	199
605	Cystitis	145
243	Urticaria	101
782	Symptoms Referable to Cardiovascular and Lymphatic System	64
	P-Code 0: Indefinite Psychosomatic	
793	Observation without Need for Further Medical Care	323
788	Other General Symptoms	70
795	Ill-Defined and Unknown Causes	20

Table 2. Principal diagnoses assigned to each P-code diagnostic group, showing the international three-digit code number, together with the diagnosis and the number of cases which were observed in the tabulations for July, 1951.

(Possible Psychosomatic). This grouping was arbitrary and undoubtedly many physicians would be inclined to shift certain diagnoses from one category to another. It was our opinion that with all its limitations this classification was sufficiently accurate for the immediate purpose and that it was preferable to include the debatable diagnoses in our analysis rather than to reject material of potential interest.

The International 3-digit code numbers included in each of the P-Code groups are shown in Table 1. Of these, the prin-

P-Code	S-Code	Observed	Expected	Difference	P Per Cent
1	Definite Psychosomatic	25	13.25	11.75	0.1
	Psychoneuroses	22	11.15	10.85	0.1
	Residual	3	2.10	0.90	53.5
2	Probable Psychosomatic	43	35.39	7.61	20.1
3	Possible Psychosomatic	68	54.75	13.25	7.3
	Anemias	9	4.36	4.64	2.6
	Other Circulatory Disorders	6	2.63	3.37	3.8
	Disorders of Gall Bladder, Pancreas & Liver	5	1.81	3.19	1.8
	Residual	48	45.95	2.05	76.4
4	Organic	413	358.59	54.41	0.4
	Benign Neoplasms	6	2.18	3.82	5.6
	Thyroid Disorders	5	2.39	2.61	9.1
	Nutritional Deficiency	5	1.29	3.71	0.1
	Anemias	5	1.77	3.23	1.5
	Organic Nervous Disorders	7	2.47	4.53	0.4
	Respiratory Infections—Mild	76	47.00	29.00	0.0
	Respiratory Infections—Severe	12	28.51	−16.51	0.2
	Other Gastro-Intestinal Disorders	10	5.58	4.42	6.1
	Genital Infections—Male	6	3.01	2.99	8.5
	Urinary Disorders	12	5.12	6.88	0.2
	Other Bone & Joint Disorders	4	1.70	2.30	7.8
	Residual	265	257.57	7.43	64.6
5	Accident	41	41.29	−0.29	96.0
0	Indefinite Psychosomatic	20	11.55	8.45	1.3
Total		610	514.82	95.18	0.0

Table 3a. Numbers of new April illnesses of various diagnoses for those ill in January 1951 compared with the numbers expected based on April prevalence among the not-ill, for male subscribers of W.M.S. aged 20 years and over.

cipal diagnoses encountered in a previous analysis are shown in Table 2 for P-Code groups 1, 2, 3, 0.

The System Code[6] represents an attempt to obtain reasonably homogeneous diagnostic groups intermediary in refinement between the three-digit diagnostic categories and the main sections of the International Statistical Classification. Altogether, there are sixty-six clinical groups in the S-Code. Anatomic system has been the principal unit, but, within it etiology and severity, in the clinical sense, have also been taken into consideration. The creation of a specific clinical group was

[6] The development of the S-Code together with tables setting forth the relationship between it and the International Statistical Classification have been presented in Reference 6.

P-Code	S-Code	Observed	Expected	Difference	P Per Cent
1	Definite Psychosomatic	74	50.10	23.90	0.1
	Psychoneuroses	64	45.59	18.41	0.6
	Other Psychiatric Problems	8	1.54	6.46	0.0
	Residual	2	2.97	−0.97	58.5
2	Probable Psychosomatic	65	46.12	18.88	0.6
	Headaches	25	13.79	11.21	0.3
	Peptic Ulcers	15	6.87	8.13	0.2
	Residual	25	25.46	−0.46	92.8
3	Possible Psychosomatic	259	229.63	29.37	5.2
	Anemias	51	37.27	13.73	2.4
	Organic Nervous Disorders	9	5.13	3.87	8.7
	Degenerative Cardiovascular Disorders	26	40.60	−14.60	2.2
	Vague Urinary Symptoms	6	1.84	4.16	0.2
	The Myalgias	29	14.05	14.95	0.0
	Residual	138	130.74	7.26	53.9
4	Organic	851	714.34	136.66	0.0
	Malignant Neoplasms	11	6.38	4.62	6.7
	Nutritional Deficiency	21	9.19	11.81	0.0
	Anemias	17	9.16	7.84	1.0
	Nasal Infections	21	13.15	7.85	3.0
	Rheumatic Infections	5	0.96	4.04	0.0
	Respiratory Infections—Mild	138	98.71	39.29	0.0
	Gastro-Intestinal Infections	31	17.69	13.31	0.1
	Anal Disorders	13	7.50	5.50	4.4
	Vague Gastro-Intestinal Symptoms	4	9.08	−5.08	9.3
	The Arthritides	35	25.17	9.83	5.0
	Residual	555	517.35	37.65	9.7
5	Accident	62	50.55	11.45	10.7
0	Indefinite Psychosomatic	33	22.01	10.99	1.9
Total		1,344	1,112.75	231.25	0.0

Table 3b. Numbers of new April illnesses of various diagnoses for those ill in January 1951 compared with the numbers expected based on April prevalence among the not-ill, for female subscribers of W.M.S. aged 20 years and over.

dependent upon the frequency of cases assigned to it as determined from observations made during an earlier study.

Because of the relatively low illness rates involved, statistical analysis of differences between rates was carried out according to the formula used by Stocks: (3)

$$t = \frac{O - E}{\sqrt{E}}$$

where O is the total number of observed illnesses and E is the

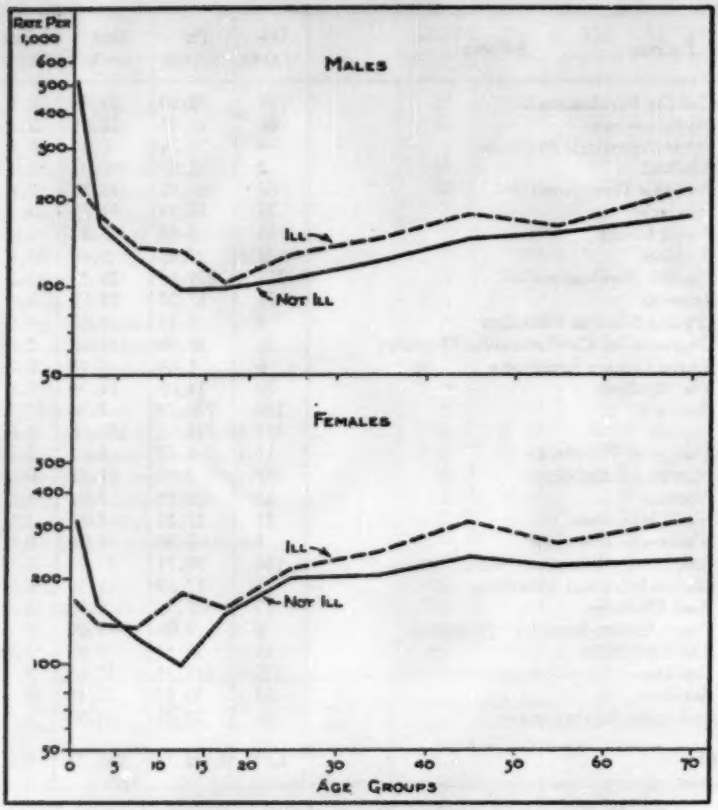

Fig. 1. New illnesses in April among persons not-ill and those ill in January. Sex and age-specific monthly prevalence rate per 1,000 for all diagnoses. Semilog scale.

total number of expected illnesses in the population. The formula was inevitably applied to the smaller population, the Ill class in this instance. Their expected total of illnesses was determined by applying to their population the age-sex specific rates of illnesses per 1,000 Not-Ill subscribers and summing the resultant age-sex specific expected illnesses. Because the Not-Ill population was considerably in excess of the Ill population, this was found to be equivalent to using pooled Ill and Not-Ill rates for calculating the expected illnesses.

The description of results will be confined to those for adults 20 years of age and over, although the graphs of age-sex specific illness rates presented in this paper do show the rates for ages under 20.

Results

A. Rates for All Illnesses Combined. The age-sex specific rates of illness for all diagnoses combined for the Ill and Not-Ill are shown in Figure 1. For each sex, the Ill group have significantly higher rates of new illness in April as revealed at the bottom of Tables 3a and 3b. In Figure 1 it can be seen that the pattern of relative differences by age-groups is the same for both sexes although females tended to have greater differences between the Ill and Not-Ill January subscribers at all ages after age group 5–9. In both sexes, peak differences occurred in age groups 10–14, 40–49 and 60+.

B. Rates by P-Code. In Figure 2a the age-sex specific April prevalence rates of illnesses by P-Code diagnostic groups have been compared for males of the Ill and of the Not-Ill classes. The two groups were undifferentiated in Probable Psychosomatic illnesses and in Accidents. Elsewhere, the males of the Ill group had rates of illness in excess of the Not-Ill. Statistically, the elevation of their rates of new April illnesses was only of borderline significance for Possible Psychosomatic illnesses ($p = 7.3$ per cent), but was highly significant for Definite Psychosomatic illnesses ($p = 0.1$ per cent) and for Organic illnesses ($p = 0.4$ per cent) as shown in Table 3a.

In Figure 2b are shown the corresponding rates for females. Although the January Ill had higher rates of Accidents in April, the excess in the Ill was not significant ($p = 10.7$ per cent, Table 3b.). The excess of Possible Psychosomatic illnesses was barely significant ($p = 5.2$ per cent, Table 3b.), while the remaining three, Definite Psychosomatic, Probable Psychosomatic, and Definite Organic illnesses gave rise to highly significant excesses in the Ill class.

C. Rates by S-Code within P-Code Groups. The Illnesses

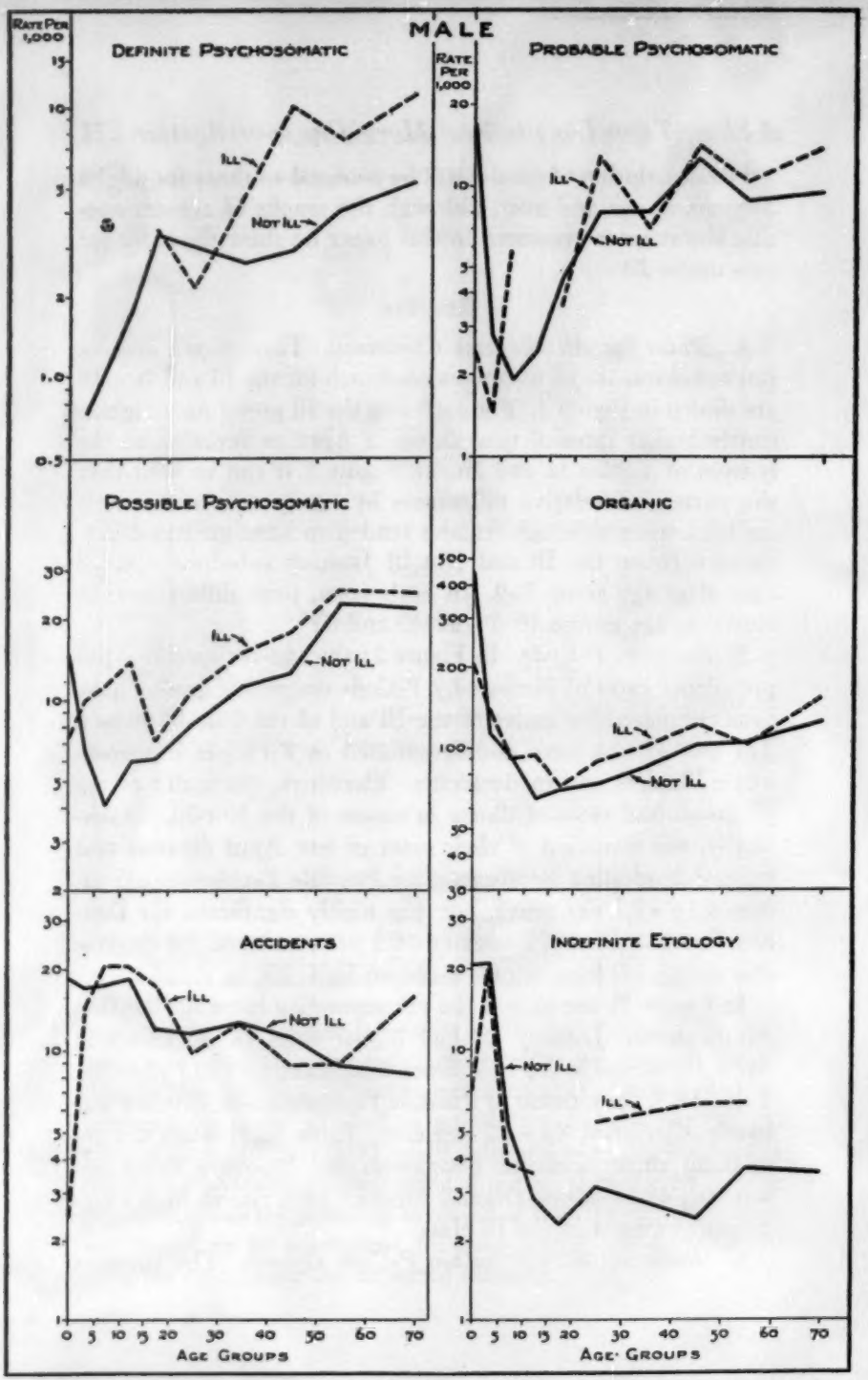

Fig 2a. New illnesses in April classified in six P-Code diagnostic groups among males not-ill and those ill in January. Age-specific monthly prevalence rate per 1,000. Semilog scale.

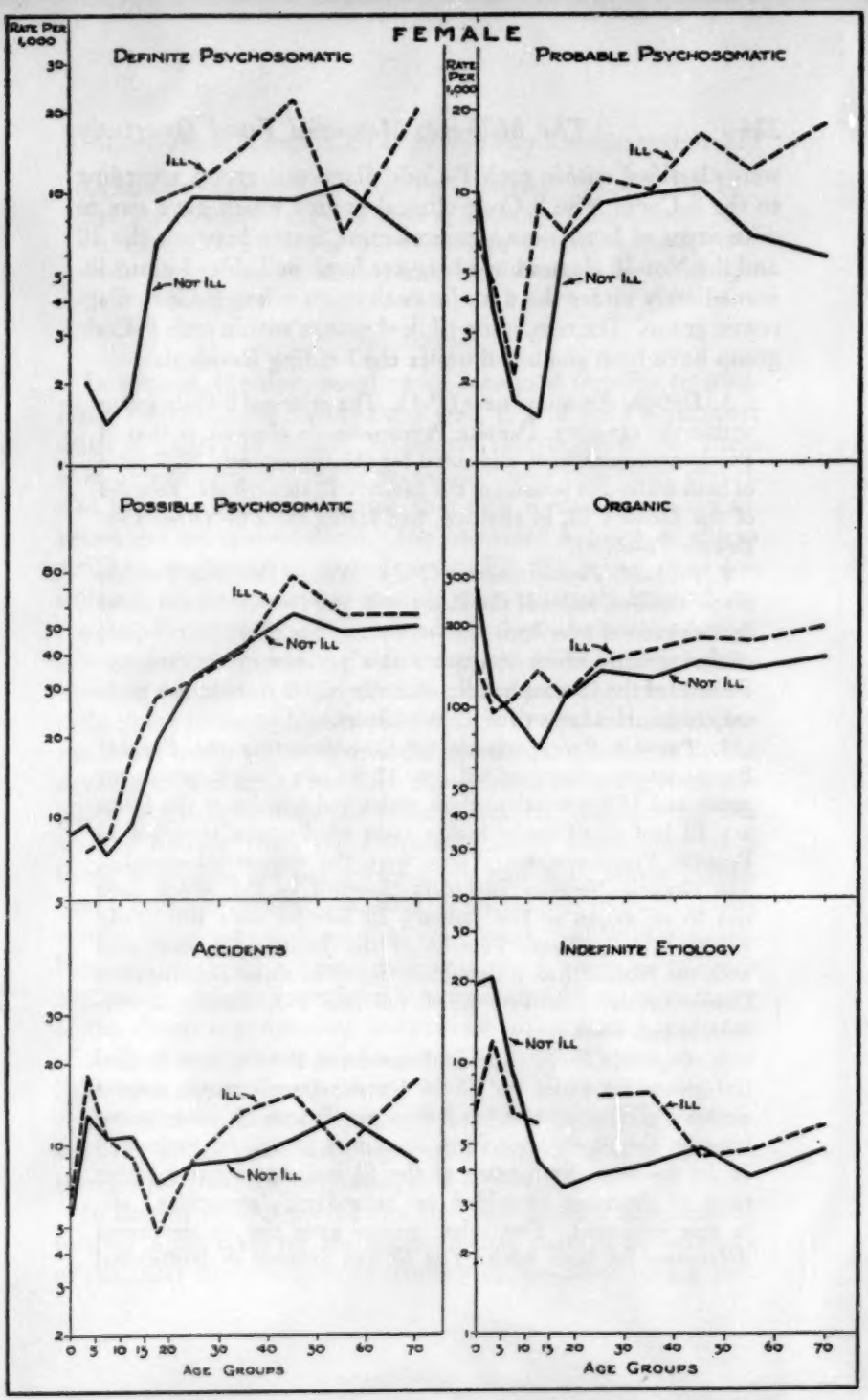

Fig. 2b. New illnesses in April classified in six P-Code diagnostic groups among females not-ill and those ill in January. Age-specific monthly prevalence rate per 1,000. Semilog scale.

were classified *within* each P-Code diagnostic group according to the S-Code. The S-Code clinical groups which gave rise to differences of borderline significance or better between the Ill and the Not-Ill classes have been set forth in Tables 3a and 3b. immediately under the data for each appropriate P-Code diagnostic group. The remaining clinical groups within each P-Code group have been combined under the heading Residual.

1. *Definite Psychosomatic* (*P-1*). The principal S-Code group within the category, Definite Psychosomatic illnesses, is that of Psychoneuroses which accounted for the significantly high rates of both males and females of the January Ill subscribers. Females of the January Ill, in addition, had higher rates of 'Other Psychiatric Problems.'

2. *Probable Psychosomatic* (*P-2*). Within Probable Psychomatic illnesses, males of the January Ill and Not-Ill did not differ in their rates of new April illnesses for any one of the four S-Code clinical groups which constitute this psychosomatic category. Females of the Ill class had significantly higher rates in two clinical groups, Headaches and Peptic Ulcers.

3. *Possible Psychosomatic* (*P-3*). Altogether the Possible Psychosomatic diagnoses fell into 11 S-Code clinical groups for males and 13 for females. Both males and females of the January Ill had significantly higher rates of Anemias classified as Possible Psychosomatic. These were the unspecified anemias. The Organic Nervous Disorders classified as P-3 which gave rise to an excess in the January Ill females were principally vertigo and dizziness. Females of the January Ill, compared with the Not-Ill, had a significant *deficit* of those Degenerative Cardiovascular Disorders which fell into P-3, namely, hypertension and heart block.

4. *Organic* (*P-4*). Organic diagnoses of P-4 fell into 51 clinical groups for males and 53 for females (confinements are excluded). Differences of borderline significance or better arose between the Ill and Not-Ill in 11 clinical groups for males and 10 for females. Both sexes of the Ill had significantly higher rates of Anemias (specified as 'secondary,' 'pernicious,' etc. in this instance). Two other groups gave rise to significant differences for both sexes: The Ill had excesses of Nutritional

Deficiencies and Mild Respiratory Infections. Males of the Ill had a significant *deficit* of Severe Respiratory Infections. In certain clinical groups of the S-Code no differences arose; for males these were Circulatory and Skin diseases; for females, Genito-Urinary and Skin diseases.

Discussion

In general, the data point to an increased liability to medically treated illness among those who were ill from some other cause in a previous month. To put the matter differently, there is some evidence of "illness proneness" over this short period. One must remember, of course, that only medically treated illnesses are being considered. The increased liability to illness could be explained in several ways. First, a person who has suffered an illness in one month may, through lowered resistance (admittedly an ill-defined concept), be more susceptible to further disease. Partial support of this comes from Downes' reports (1, 2) where it would appear that the chronically ill are liable to higher rates of new illness. Second, a person living under physical or social conditions conducive to the development of illness may, for that reason, have a greater liability to illness in both the periods studied. Support for this view is derived from the frequently made observation that living standards are negatively correlated with illness experience. Another explanation, that of increased liability among certain persons to seek medical care, must also be considered. However, with the present data it is not feasible to advance any one hypothesis in preference to another. A long-term study of the illness experience of individuals which took cognizance of their environmental conditions as well, could throw further light upon these observations.

Two of the P-Code groups, Accidents and Indefinite Psychosomatic, will be dealt with separately because of their relative segregation from the psychosomatic continuum.

In neither sex did the Ill and the Not-Ill differ significantly in their April rates for accidents, so that there is no evidence in the short run of a greater liability to accidents among per-

sons who have recently suffered an illness. Such an increased liability could, however, be obscured by the fact that some persons ill in January might still be convalescent in April and thereby less exposed to environmental hazards.

The latter P-Code group, Indefinite Psychosomatic, cannot be discussed because of the very nature of the diagnoses which make up the group. Nevertheless, it may be pointed out that this group was not responsible for the differences observed in the remaining groups. That is, differences arising in this group of diseases did not oppose or offset differences arising in the other diagnostic components of the P-Code. In passing, it may be noted that over 90 per cent of the services rendered for these indefinite illnesses were diagnostic services.

Since the remaining components of the P-Code contributed almost equally to the excess of April illness among the Ill, one may conclude that the increased liability to illness among the January Ill as a whole is not a selective one with regard to the Psychosomatic continuum.

When the higher April illness rates of the January Ill were examined in terms of the specific disease groups of the S-Code it was found that the excesses were more marked for certain types of illness. For example, in both sexes, the Ill group had higher rates for Anemias, Nutritional Deficiencies, and for Mild Respiratory Infections. These findings suggest that the increased short-term sickness liability of certain subscribers is specific in nature. The question of whether the January Ill group represents persons with temporarily lowered resistance, a generally unfavourable environment or a greater interest in receiving medical treatment is not answered by this analysis but it does become clear that the operative factors may best be sought in terms of the specific diseases whose prevalence is increased among the Ill class.

For the two significant deficits among the January Ill mentioned above, namely, Severe Respiratory Infections in males and Possible Psychosomatic Degenerative Cardiovascular Disorders in females, no explanation can be offered. In neither in-

stance could the deficit be attributed to overly strict deletion of April illnesses which might have been related to medically treated January illness. If such were the case both sexes might be expected to have a deficit whereas females had a non-significant excess of Severe Respiratory Infection and males had a non-significant excess of Psychosomatic Degenerative Cardiovascular diseases.

An attempt was made to discover associations between the S-Code clinical groups in which the Ill and Not-Ill differed significantly. The only meaningful result which emerged was that obtained from an analysis in which illnesses were classified according to chronicity. Those clinical groups of the S-Code which were essentially acute in nature were amalgamated as were those which were essentially chronic. Adults of both sexes of the Ill class had excesses of chronic illness while only females had an excess of acute illnesses compared with the Not-Ill class of subscribers.

Having observed that the two primary classes, the Ill and the Not-Ill, differ in their subsequent illness experience, one then wishes to know whether the increased sickness liability of the former is a non-specific phenomenon or whether it arises from specific associations between particular diseases in the same person. Before the data were collected, it had been decided to classify the Ill by applying the Psychosomatic Code to their January illnesses. This phase has been completed. Other classifications suggested by the foregoing analysis are the division of patients according to whether their January illnesses were chronic, sub-acute, or purely acute in nature; and the division of patients according to the clinical classification of their January illnesses in terms of the System Code, paying special attention to those clinical groups which were responsible for significant differences in April between the Ill and Not-Ill classes of W.M.S. subscribers.

Summary

1. Adult subscribers to a pre-paid medical care plan who

were ill in January, 1951, when compared with those subscribers who were not ill in January, 1951, had significantly higher illness prevalence rates in April, 1951. Only medically treated illnesses are considered. The April illness rates exclude all illnesses for which treatment was given in January.

2. The January Ill had significantly higher rates of new illnesses for both the Definite Psychosomatic and Definite Organic groups of the Psychosomatic Code. They did not have significantly higher rates for Accidents in April.

3. The higher rates of the January Ill were not uniform throughout the clinical groups of the System Code. No pattern of selectivity was discernible, other than a tendency for the excess to be more marked for Chronic than for Acute illnesses, especially among males.

4. In certain clinical groups of the System Code no differences arose. For males, these were Circulatory and Skin diseases; for females, Genito-Urinary and Skin diseases. The January Ill had two inexplicable deficits compared with the Not-Ill subscribers, namely, for Severe Respiratory Infections in males and for Degenerative Cardiovascular Disorders (hypertension and heart block only) in females.

Acknowledgments

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MATERNAL AND NEWBORN NUTRITION STUDIES AT PHILADELPHIA LYING-IN HOSPITAL*

NEWBORN STUDIES. I. SIZE AND GROWTH OF BABIES OF MOTHERS RECEIVING NUTRIENT SUPPLEMENTS

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THE Nutrition Study carried on at the Pennsylvania Hospital from 1947 to 1952 was designed to investigate the effect of the addition of protein and vitamin supplements to the diets of pregnant women upon the outcome of their pregnancy and upon the physical status of their infants. The previous reports from the Study have dealt primarily with the first of these two questions, and it is with the second, the relationship between supplementation of the maternal diet and the physical status of the baby, that this report is concerned.

Under the plan of the study, women coming to the Clinic of the Hospital during the first 16 weeks of pregnancy were referred to the Nutrition Clinic. There they were assigned to one of four groups, on a random basis controlled for race, age, and gravida. One group was designated as the control and was given no nutritional supplement, a second group was given vitamins only, the third group a protein supplement only, and the fourth group was given both vitamins and the protein supplement.[4] Uniform diet instructions were given to the women

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[4] The nutrient supplements used in this study are: Therapeutic polyvitamin concentrate (Upjohn's Zymacaps and E. R. Squibb & Sons' Theragran) three capsules per day; Protein concentrate (Mead Johnson & Company's Protenum), to furnish 50 gms. of protein daily if taken as advised.

in all four groups during their first visit to the Clinic, and were reemphasized at several subsequent visits. At birth, all infants were placed on the same regime in the hospital, and the mothers were given the same diet instructions and vitamin supplements for their babies.

The physical status of the infants of the women in each of these four groups has been evaluated in terms of weight, crown-sole length, and chest circumference at birth and at one, two, and three months. The study groups have been compared on the basis of the mean values of these measurements to estimate the influence of the nutritional supplements taken by the mother upon the physical status of her infant. The measurements were made in a uniform manner, and during much of the study, were done by the same pediatrician (A.R.).[5] The infants were weighed nude on a scale measuring in units of pounds and ounces and the weight was read to the nearest ounce. The crown-sole length was measured with the baby placed flat and straight on a board and the measurement was made from the plane tangent to the top of the head to the bottom of the heels. The measurement of chest circumference was made with a steel tape at the level of the xiphoid, normal to the body axis. Both length and chest circumference were measured in centimeters to the nearest tenth.

In this report twins and premature infants, defined as weighing less than 5½ lbs. at birth, are excluded, as are babies born to mothers who had a serious chronic disease or syphilis.[6] From the interviews with the patients by the nutritionist and examination of the records of the amount of protein supplement provided each patient in the protein groups, it appeared that some had not taken the supplement in the desired quantity. In the present analysis, infants have been excluded if the mother took some of the protein supplement over a period of

[5] Measurements not done by Alexander Randall, IV, M.D. were done by Josephine Perlingiero Randall, M.D., and Thomas R. Boggs, M.D.

[6] Patients with chronic disease or syphilis referred to the Nutrition Research Clinic were carried but have been excluded from tabulations in this report. Chronic diseases excluded are essential hypertension, chronic heart classified II-a or higher, chronic nephritis, and chronic pyelitis.

several months but was given less than a total of 20 lbs. of the supplement compared with the scheduled maximum of 45 to 50 lbs.

The number of infants on whom acceptable measurements were made varied with the measurement and with the age of the infants. Birth weight is available for 1,141 infants divided among the groups as follows: 404 in the controls, 356 in the vitamin group, 185 in the protein group, and 196 in the vitamin and protein group. The number of measurements of length and chest circumference at birth is slightly less and still more attrition occurred in the population measured at one, two, and three months, since the mothers did not always bring their infants to the clinic for the regular monthly examination. The condition of these babies at birth was good as indicated by the appraisal by the pediatrician at the newborn physical examination. Two-thirds were rated as good or excellent and less than 3 per cent as poor.

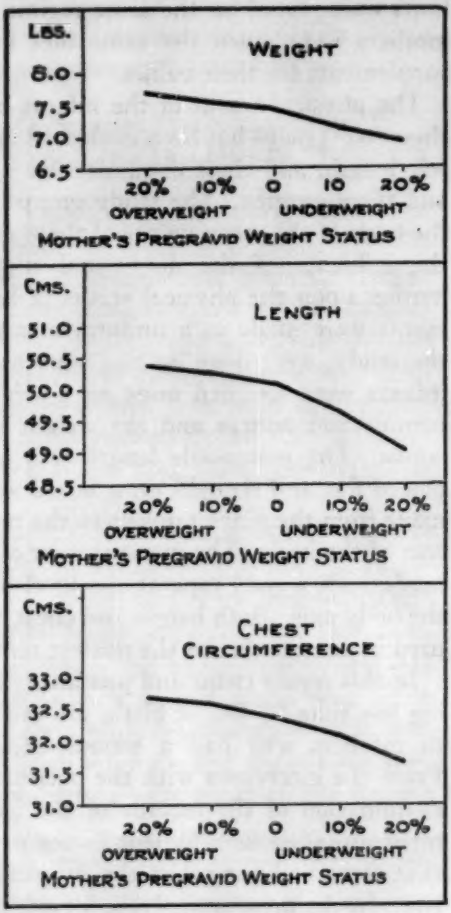

Fig. 1. Mean weight, length, and chest circumference at birth by mother's pregravid weight status.

Mother's Pregravid Weight Status	Weight (Lbs.)			Length (Cms.)			Chest Circumference (Cms.)		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
Overweight 15 Per Cent or More	247	7.69	.07	227	50.36	.14	227	32.69	.12
Overweight 5–14 Per Cent	210	7.52	.07	195	50.24	.14	193	32.56	.13
Within 5 Per Cent of Normal	349	7.42	.05	321	50.06	.12	319	32.32	.09
Underweight 5–14 Per Cent	233	7.12	.06	219	49.61	.13	216	32.08	.11
Underweight 15 Per Cent or More	102	6.90	.07	95	49.01	.17	94	31.62	.16

Table 1. Mean weight, length, and chest circumference at birth by mother's pregravid weight status.

There was no difference among the study groups in the distribution of appraisals.

Previous analysis has demonstrated an association between prematurity and the pregravid weight status of the mothers. There is also a definite relationship, shown in Figure 1 and Table 1, between the birth measurements of non-premature infants and pregravid weight status.[7] The largest means for each measurement are found for infants of mothers 15 per cent or more overweight before pregnancy and the smallest are noted for babies of the most underweight mothers. Over the weight groups between these two extremes, the mean values decrease uniformly. This relationship is independent of the nutritional supplements taken by the mothers, being found for each of the four study groups.

The mean values for weight, length, and chest circumference at birth are shown in Table 2 for each study group. The mean

[7] Patients were carefully questioned in the Clinic as to their immediate pregravid weight and were measured for height without shoes. The standard weight for a specific height and age used is from the Report of the Medico-Actuarial Investigation 1912–1914 up to age 25 years. The average weight at 25 years is extended to older ages and the value used is the mid-point of the weight range for women of medium frame published by the Metropolitan Life Insurance Company.

Table 2. Mean weight, length, and chest circumference at birth by study group.

Study Group	Weight (Lbs.)			Length (Cms.)			Chest Circumference (Cms.)		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
Control	404	7.45	.05	384	50.02	.11	383	32.29	.09
Vitamin	356	7.29	.05	315	49.85	.11	313	32.38	.10
Protein	185	7.40	.07	173	49.96	.15	171	32.17	.13
Vitamin and Protein	196	7.43	.07	186	50.06	.15	182	32.34	.12

Table 3. Mean weight, length, and chest circumference at birth of infants of mothers never transferred from assigned study group.

Study Group	Weight (Lbs.)				Length (Cms.)				Chest Circumference (Cms.)			
	Total	Total Nontransfers			Total	Total Nontransfers			Total	Total Nontransfers		
	Mean	No.	Mean	Standard Error	Mean	No.	Mean	Standard Error	Mean	No.	Mean	Standard Error
Control	7.45	300	7.48	.06	50.02	292	50.19	.12	32.29	290	32.32	.10
Vitamin	7.29	293	7.33	.06	49.85	257	49.90	.13	32.38	255	32.42	.11
Protein	7.40				49.96				32.17			
Vitamin and Protein	7.43				50.06				32.34			

birth weights for babies in the control group, the protein group, and the vitamin and protein group are about equal (7.40 to 7.45 lbs.) with the mean for those in the vitamin group being somewhat lower (7.29 lbs.). The four birth-weight means do not differ significantly[8] when tested by analysis of variance, but the means for the vitamin group is significantly smaller than the combined mean of the other three groups. The means of the crown-sole lengths at birth are in much the same pattern as were the mean birth weights, the control and the protein plus vitamin groups having the largest means, and the vitamin group the lowest. In contrast, the largest value among the means of chest circumference at birth is noted for the vitamin group (32.38 cms.) and the lowest among the protein group (32.17 cms.). However, the differences among the means of neither length nor chest circumference are statistically significant.

These mean measurements for the control and vitamin groups may have been affected by the inclusion of infants of mothers not originally assigned to these groups. Some patients allocated to the protein groups either could not or would not take the protein supplement. Of these women, those who had been assigned to the protein and vitamin group were transferred to the vitamin group, and those assigned to the protein group were transferred to the control group. None of these transfers took more than 10 lbs. of the protein supplement. In addition, a small number in the vitamin group who were unable to take the vitamin capsules were transferred to the control group. In order to evaluate the effect the transfer of these patients may have had upon the results for their study group, the mean measurements for infants in the control and vitamin groups were recomputed with the babies of the transfers eliminated, that is, with only the infants of patients originally assigned to these groups included. These means are shown in Table 3, and suggest that the babies of these transferred patients did tend to depress the mean values for their study group

[8] Statistical significance in this report implies $P \leq .05$.

Table 4. Mean weight, length, and chest circumference at birth by race, sex, and study group.

Study Group	White Males			White Females			Negro Males			Negro Females		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
	WEIGHT (LBS.)											
Control	160	7.58	.08	140	7.37	.08	47	7.47	.15	57	7.24	.15
Vitamin	145	7.39	.08	120	7.14	.08	48	7.51	.17	43	7.09	.13
Protein	75	7.56	.10	60	7.37	.12	30	7.23	.16	20	7.13	.21
Vitamin and Protein	87	7.62	.11	65	7.22	.11	25	7.30	.19	19	7.41	.25
	LENGTH (CMS.)											
Control	158	50.44	.16	127	49.79	.18	46	50.24	.34	53	49.16	.26
Vitamin	136	50.14	.19	105	49.51	.17	39	50.35	.33	35	49.19	.30
Protein	73	50.35	.20	54	49.76	.31	27	49.80	.40	19	49.24	.46
Vitamin and Protein	84	50.26	.25	60	49.83	.25	24	49.71	.36	18	50.39	.55
	CHEST CIRCUMFERENCE (CMS.)											
Control	156	32.41	.14	128	32.37	.13	46	32.17	.26	53	31.88	.26
Vitamin	135	32.64	.15	104	32.27	.17	39	32.32	.33	35	31.73	.27
Protein	72	32.49	.19	54	32.24	.23	26	31.69	.38	19	31.45	.39
Vitamin and Protein	82	32.68	.18	60	32.12	.15	23	31.63	.37	17	32.38	.35

to a slight extent. However, the overall pattern of means among the study groups is much the same, and the measurements for the infants of the transfers have been included in the tables which follow.

The mean values of weight, length, and chest circumference at birth are shown for each study group by race and sex in Table 4. The variation of the study group means within each race-sex group is not statistically significant except for the means of length for the Negro male babies. The relatively low mean weight in the vitamin group noted for the total population is found for each race-sex group except Negro males among whom this mean was largest. The lowest mean length for white males and females is also found in the vitamin group.

The data presented thus far do not give any substantial indication of a relationship between the nutritional supplement taken by the mother and the size of her infant at birth. The infants in the control group appear to be no different in weight or body dimensions than the offspring of mothers receiving the supplements. In fact, there is some suggestion that the babies in the vitamin group tend to be a little lighter at birth than those in the other groups.

In order to see whether this tendency for the babies in the vitamin group to have a smaller mean weight than those in the other three groups persists when factors which are known to influence the birth weight are allowed for, the means of the birth weight by race and gravida are given in Table 5, by gravida and age of mother in Table 6, and by race and mother's pregravid weight status in Table 7. A lower mean weight is noted for the vitamin group for babies of both white and Negro primagravidae and for white multigravidae. (Table 5.) The mean weight for this group was also lowest for infants of primagravidae in both age categories and of the older multigravidae. (Table 6.) This was also true for white infants of mothers in each pregravid weight-status classification but not for Negro babies. (Table 7.) Thus, it does not appear that the low mean weight in the vitamin group is related to the fac-

Table 5. Mean weight at birth by race, gravida, and study group.

Study Group	Primagravidae						Multigravidae					
	White			Negro			White			Negro		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
Control	122	7.37	.08	45	7.21	.16	178	7.57	.08	59	7.45	.14
Vitamin	99	7.21	.11	31	7.12	.16	166	7.34	.07	60	7.41	.14
Protein	55	7.34	.12	14	7.53	.25	80	7.55	.10	36	7.06	.15
Vitamin and Protein	62	7.25	.12	14	7.24	.21	90	7.60	.11	30	7.39	.20

Table 6. Mean weight at birth by age of mother, gravida, and study group.

Study Group	Primagravidae						Multigravidae					
	Under 25 Years			25 Years and Above			Under 25 Years			25 Years and Above		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
Control	123	7.38	.09	44	7.16	.12	76	7.40	.11	161	7.59	.08
Vitamin	88	7.21	.11	42	7.11	.16	66	7.53	.12	160	7.29	.07
Protein	42	7.43	.13	27	7.30	.20	35	7.31	.19	81	7.45	.09
Vitamin and Protein	58	7.26	.11	18	7.22	.26	36	7.76	.18	84	7.46	.12

Table 7. Mean weight at birth by race, mother's pregravid weight status, and study group.

Study Group	Underweight 5 Per Cent or More			Normal			Overweight 5 Per Cent or More		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
	WHITE								
Control	88	7.06	.09	88	7.57	.10	124	7.73	.09
Vitamin	76	6.99	.09	86	7.37	.11	103	7.45	.10
Protein	39	7.17	.15	43	7.46	.10	53	7.68	.13
Vitamin and Protein	58	7.17	.12	50	7.46	.14	44	7.85	.17
	NEGRO								
Control	31	6.95	.16	22	6.91	.19	51	7.77	.16
Vitamin	22	6.91	.16	27	7.37	.21	42	7.48	.16
Protein	7	7.13	.28	19	7.49	.20	24	6.96	.19
Vitamin and Protein	14	6.92	.20	14	7.43	.28	16	7.66	.27

Table 8. Mean weight at birth by case number classes and study group.

Study Group	Case Number					
	1–999			1,000 and Above		
	No.	Mean	Standard Error	No.	Mean	Standard Error
Control	167	7.38	.08	237	7.51	.06
Vitamin	204	7.20	.07	152	7.43	.08
Protein	70	7.47	.11	115	7.36	.08
Vitamin and Protein	74	7.41	.12	122	7.45	.09

Table 9. Mean of the difference, birth weight minus expected weight, by study group, and by case number classes and study group.

Study Group	All Cases			Case Number					
				1-999			1,000 and Over		
	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
Control	381	−.015	.026	152	−.156	.042	229	.078	.030
Vitamin	313	−.117	.029	168	−.222	.042	145	.003	.036
Protein	171	−.033	.033	61	−.132	.058	110	.024	.039
Vitamin and Protein	182	.009	.038	69	.018	.064	113	.006	.048

tors of gravida, age of mother, or mother's pregravid weight status, since the mean for this group generally remains low when these factors are held constant.

An unpublished analysis of data from the Nutrition Clinic showed that a decrease took place during the six-year period of the study in the occurrence of premature births. This suggested that there may have also been a trend toward higher average birth weights as the study continued. This hypothesis was investigated by classifying the infants of each study group into six classes according to their case number, computing mean birth weights for each class, and fitting trend lines for each study group to these means. It was found that the slopes of these lines do not differ significantly from zero, indicating that no uniform change in weights occurred over the period of the study. It may be seen, however, in Table 8, which shows the means for those with case numbers above and below 1,000, that the lower mean weight in the vitamin group is related to low weights among the early entrants in this group. The shift in mean weight in the vitamin group from 7.20 lbs. among the earlier cases to 7.43 lbs. among the later ones is of statistical significance, while this is not true for the changes in the other three groups.

The nutritional status of infants at birth has been evaluated in a previous report from the Nutrition Clinic (1) by calculating the difference between the birth weight and an expected weight derived from a multiple regression equation of weight, length, and chest circumference.[9] This index may take either positive or negative values, and the lower the value of the index the poorer the nutritional status is presumed to be. The means of this index for each study group are shown in Table 9

[9] These calculations were made from multiple regression formulae as follows:
(L = crown-sole length and Ch. = chest circumference.)
Whites, male and female:
Expected weight = .236 cms. L + .286 cms. Ch. − 13.59
Colored, male and female:
Expected weight = .133 cms. L + .420 cms. Ch. − 12.68
The formulae are based on data for babies born to patients of any pregravid weight status that were rated excellent or good in the first week of life by the pediatricians for the Nutrition Research Clinic.

Table 10. Mean weight, length, and chest circumference at birth, and 1 month, 2 months, and 3 months of age by study group.

Study Group	Birth	1 Month			2 Months			3 Months		
	Mean	No.	Mean	Standard Error	No.	Mean	Standard Error	No.	Mean	Standard Error
	WEIGHT (LBS.)									
Control	7.45	301	9.03	.06	222	11.21	.09	223	13.04	.11
Vitamin	7.29	281	8.84	.06	201	11.05	.09	213	12.88	.11
Protein	7.40	156	8.85	.08	105	11.19	.12	120	13.06	.14
Vitamin and Protein	7.43	148	8.96	.08	117	11.14	.12	117	13.12	.13
	LENGTH (CMS.)									
Control	50.02	303	54.07	.13	223	57.62	.14	223	60.58	.14
Vitamin	49.85	278	53.87	.13	203	57.34	.15	215	60.43	.16
Protein	49.96	156	54.01	.16	105	57.89	.20	122	60.62	.21
Vitamin and Protein	50.06	148	54.16	.18	116	57.69	.21	117	60.64	.22
	CHEST CIRCUMFERENCE (CMS.)									
Control	32.29	301	35.93	.10	223	38.46	.12	223	40.22	.13
Vitamin	32.38	272	35.74	.11	202	38.27	.12	213	40.26	.13
Protein	32.17	156	35.80	.14	105	38.57	.15	122	40.42	.16
Vitamin and Protein	32.34	147	35.87	.13	116	38.57	.15	117	40.53	.17

and that of the vitamin group (−.117) is significantly lower than those for the other three groups, indicating a less favorable nutritional status for the infants in this group. However, when the population is divided according to case numbers above and below 1,000, it may be seen that the poorer nutritional status of babies in the vitamin group is found only during the first part of the study. The mean index is significantly higher during the second part of the study for all infants except those whose mothers received both vitamins and the protein supplement. The nutritional index for infants in this latter group remains about the same over the entire study and is significantly higher than the means for the other three groups during the earlier part of the study.

The growth of the infants during the first three months after birth is indicated in Table 10, giving the means of the three measurements at birth, and one, two, and three months of age

Table 11. Per cent increase in the means of weight, length, and chest circumference from birth to 1 month, 2 months, and 3 months of age, by study group.

Study Group	Per Cent Increase from Birth to:		
	1 Month	2 Months	3 Months
	WEIGHT		
Control	21.2	50.5	75.0
Vitamin	21.5	52.3	76.7
Protein	19.6	51.2	79.1
Vitamin and Protein	20.6	50.6	76.6
	LENGTH		
Control	8.1	15.2	21.1
Vitamin	8.1	15.0	21.2
Protein	8.1	15.9	21.3
Vitamin and Protein	8.2	15.2	21.1
	CHEST CIRCUMFERENCE		
Control	11.3	19.1	24.6
Vitamin	10.4	18.2	24.3
Protein	11.3	19.9	25.6
Vitamin and Protein	10.9	19.3	25.3

for each study group. The per cent increase in the means from birth at each month of age is given in Table 11. The relative magnitude of the means of weight and length remains much the same among the study groups during the first three months after birth. The lowest mean values of these measurements continue to be noted for the vitamin group during this period. The increase in the means of each measurement during the first three months of infancy is much the same for each study group. The percentage change for any one measurement is quite uniform among all study groups with slightly more variation among the increases in weight than for length or chest circumference. There is no evidence in these data that growth of an infant during the three months after birth is affected by the nutritional supplement taken by the mother during pregnancy. Analysis of the same material by race and sex also failed to suggest any consistent difference between nutritional supplements in their effect on infant growth.

The means of the minimum weights following post-natal weight loss are shown in Table 12 for each study group, along with per cent of birth weight lost, and the per cent gain in weight from the minimum to 1 month. Here again there seems to be no apparent differences among the study groups, either in relative amount of weight lost post-natally or in the ability to establish weight gain after this loss.

The conclusions to be drawn from this analysis are mostly

Table 12. Mean minimum weight after birth, per cent decrease from mean birth weight, and per cent increase to mean weight at 1 month of age, by study group.

Study Group	Minimum Weight (lbs.)			Per Cent Decrease from Mean Birth Weight	Per Cent Increase to Mean 1 Month Weight
	No.	Mean	Standard Error		
Control	400	6.97	.05	6.4	29.6
Vitamin	352	6.82	.05	6.4	29.9
Protein	181	6.92	.07	6.5	27.9
Vitamin and Protein	193	6.98	.07	6.1	28.4

negative. No consistent differences were found between babies in the control group, whose mothers received no nutritional supplementation, and those in the two groups whose mothers received the protein supplement with respect to size and nutritional status at birth or growth during the first three months of life. There is some evidence that the babies of mothers who received the vitamins alone tend to be lighter at birth than the infants in the other groups and that their nutritional status at birth as a group was poorer than that of the other babies. However, both of these tentative conclusions apply only to the infants born during the earlier part of the study. Although the mothers' diet histories have not yet been analyzed in sufficient detail to substantiate it, the impression of persons connected with the Clinic is that the general level of diet while good for a large majority of patients may have been lower in the early years of the study than in the later years. This would suggest that the vitamin supplement may have had a slight adverse effect upon infants of women on a relatively poor diet. If there is such an effect it is evidently offset by protein supplementation, since it was not noted among the infants of mothers who took both vitamins and proteins. The combined vitamin and protein supplementation may be effective in inducing a more favorable nutritional status at birth in babies of mothers on a relatively poor diet, since the mean index of nutritional status for infants in this group was significantly higher than the means for the other groups during the earlier part of the program.

In summary, with these reservations concerning the effect of vitamins, and of the combined vitamin and protein supplementation, it seems evident that the dietary supplements given to the mothers in this study had no effect upon the physical status of their infants at birth or upon their growth during the first three months of life.

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SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING FERTILITY

XXVIII. THE INFLUENCE OF SIBLINGS AND FRIENDS ON FERTILITY[1]

ROBERT G. POTTER, JR. AND JOHN F. KANTNER

THIS report examines the relationships between the family sizes of couples in the Indianapolis sample and those of their siblings and friends. In a previous article[2] the influence of another "primary group," the family of origin, was investigated with generally negative results so far as the present sample is concerned. However there are both theoretical and methodological reasons for expecting closer fertility relationships in connection with contemporary "primary" groups. Indeed, as it turns out, fertility of friends provides the closest correlate of planned family size uncovered by the Indianapolis Study of Fertility.

Before considering these matters, however, it is appropriate to summarize the experience of one of the authors with a related set of items. The Indianapolis Study included among its original hypotheses the following two: the relevance of "childhood situations" and the relevance of "conformity to group patterns" to both fertility and fertility planning. Information about the primary groups and their fertility represents only part of the data collected to test these hypotheses.

CHILDHOOD SITUATIONS

To test the hypothesis that childhood experiences influence fertility, several types of information were collected about the family of origin in addition to its size. These may be classified

[1] This is the twenty-eighth of a series of reports on a study conducted by the Committee on Social and Psychological Factors Affecting Fertility, sponsored by the Milbank Memorial Fund with grants from the Carnegie Corporation of New York. The Committee consists of Lowell J. Reed, Chairman; Daniel Katz; E. Lowell Kelly; C. V. Kiser; Frank Lorimer; Frank W. Notestein; Frederick Osborn; S. A. Switzer; Warren S. Thompson; and P. K. Whelpton.

[2] Kantner, J. F., and Potter, R. G.: Social and Psychological Factors Affecting Fertility, XXIV. The Relationship of Family Size in Two Successive Generations. The Milbank Memorial Fund *Quarterly*, XXXII, No. 3, July, 1954, pp. 294–311. (Reprint pp. 1069–1086.)

as those dealing with (1) the affectional tone of the home (e.g., happiness of children, happiness of parents) and the difficulties encountered by the parents in raising their children,[3] (2) the extent to which parents actively encouraged their children to have families of their own, and (3) the structural characteristics of the family of origin (e.g., marital history of parents, ordinal position and number of siblings, occupation, and education of parents). Although there is much that is interesting in these data, no association between them and either fertility or fertility planning has been found. This negative result is especially true for the items relating to the assessment of childhood and parental encouragements to family formation (1 and 2 above). Regarding the structural characteristics, couples reared in broken homes or reared by persons other than their biological parents exhibit above-average fertility. Examined within socio-economic categories, however, these differences tend to disappear.

Reasons for so many negative findings are not difficult to find. During the time that elapses between childhood and marriage, early experiences become entangled with a multitude of other influences, the disentangling of which poses formidable problems in a nonlongitudinal study. Even if full information were available on all significant intervening influences, the small size of the Indianapolis sample and the frequently skewed response distributions would tend to frustrate analysis. Other problems probably arise because childhood is recalled so selectively. This does not mean, however, that future research should ignore the childhood milieu. With the aid of more appropriate study designs certain early influences may yet appear as important determinants of fertility.

Conformity to Group Patterns

Among the hypotheses formulated at the outset of the Indianapolis Study was one that posited a relationship between

[3] E. F. Borgatta and C. F. Westoff have used these items in a scale which they call "happiness of family and childhood situations." *See* Social and Psychological Factors Affecting Fertility. XXV. The Prediction of Total Fertility. The Milbank Memorial Fund *Quarterly*, XXXII, No. 4, October, 1954, p. 408. (Reprint p. 1112.)

conformity to group patterns and both fertility and contraceptive effectiveness. Over half of the items here probe for values pertinent to fertility (ideal number of children, best age to marry, best birth intervals, attitude toward childlessness, attitudes toward birth control clinics and birth control advertisements, etc.). A modal or median response has been ascertained for each value. However, the degree of deviation from these empirically established norms shows little relationship either to fertility or fertility planning. The result is also negative when conformity, measured by an interviewer rating scale, is treated as a personality trait.

Though adding little to our knowledge of fertility differentials, the responses to the "conformity" questions are of interest in their own right. For example, three-fourths of the wives said that for families "in moderate circumstances" two or three children are ideal. This holds rather uniformly in each of the various fertility-planning groups. Birth control ads in magazines and birth control clinics are favored by an overwhelming number of wives (only a little more than 5 per cent of the wives state that they are "opposed" to clinics or even indifferent about their value). Similarly, few wives approve of having children as late as age 40. The preferred period of reproduction for most respondents, then, falls short of a dozen years on the basis of their statements as to ideal age at marriage, ideal interval from marriage to first birth, and best age to complete the family. However, this preferred period of child-bearing is long enough on the average so that if the couples had followed the "ideal" birth interval of two years reported by most wives, they would have had substantially larger families than they did.

Thus far "conformity" has been approached in two ways. It has been treated as acceptance or nonacceptance of the majority position on various values pertinent to fertility and secondly as a generalized personality trait. In the present analysis "conformity" is viewed more narrowly as responsiveness to the fertility examples provided by relatives and friends. This type

of responsiveness is investigated by examining the fertility correlations between couples and their primary groups.

Propositions To Be Tested

Information is available on the family sizes of husband's siblings, wife's siblings, and wife's best friends. The remainder of this report is devoted to analyzing correlations between fertility values of the Indianapolis Study couples and these three groups. The analyses are set up to test three main propositions:

(1). There is a positive relationship between one's own family size and the family size of one's married siblings (to be stated henceforth as the relationship between couple fertility and sibling fertility). This relationship is true for either husband's or wife's siblings.

(2). The relationship between fertility of couples and fertility of friends is also direct and substantially stronger than the one above.

(3). In the "efficient family planner" sample these relationships maintain their strength within socio-economic status. However in the "inefficient family planner" sample, effectiveness of contraception decreases with decreasing socio-economic status, giving a strong relationship between status and family size. Hence in this sample the relationships hypothesized in (1) and (2) above should be reduced when socio-economic status is held constant.

The "relatively fecund" couples are classified as "efficient family planners" or "inefficient family planners" according to their success at birth control.[4] The "efficient planners" all claim that they had their last pregnancy only when they stopped contraception for the purpose. The inefficient planners admit to one or more "unwanted pregnancies."[5]

[4] A description of the criteria for "relatively sterile" and "relatively fecund" is provided in Whelpton, P. K., and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. VIII. The Comparative Influence on Fertility of Contraception and Impairments of Fecundity. The Milbank Memorial Fund *Quarterly*, XXVI, No. 2, April, 1948, pp. 182–236 (Reprint pp. 303–358).

[5] More specifically, the "efficient planners" include those couples who had no pregnancies that were not deliberately planned by stopping contraception in order

(Continued on page 250)

The three propositions above are directed toward couples who have completed their family building. This ideal condition is not quite met by the Indianapolis couples. Their marriage durations of 12–15 years mean that they probably have completed from 80 to 90 per cent of their eventual fertility.[6] In other respects, too, the sample is highly specialized. The couples are native-white Protestants, married during 1927–29 with neither spouse previously married, with husband under 40 and wife under 30 at the time of marriage, with city residence during most of the time since marriage, and with both husband and wife having at least a complete grammar school education.

To the authors' knowledge no previous tests have been made of the relatedness of family sizes among siblings or friends. Thus there is little guidance for expectations. The hypothesis that siblings and couples are directly related in their fertilities must be regarded as provisional. In the first place, the same couples show no relationship between their fertility and that of their parents'.[7] This result disagrees with other studies which on large samples have reported correlations

to conceive and those whose last pregnancy was deliberately planned by stopping contraception in order to conceive but who had one or more pregnancies under other circumstances. In previous reports in the Indianapolis series, these groups have been referred to as "Number and Spacing Planned" and "Number Planned" respectively. The "inefficient planners" are couples classified as least successful in planning family size because one or more pregnancies occurred after the last that was wanted. It is recognized that probably in some cases the "unwanted" pregnancy was "wanted" by the time it occurred. In previous reports this group has been designated as "Excess Fertility." An additional group of couples, the "Quasi-Planned" in earlier reports, who did not deliberately plan the last pregnancy, but who either wanted the last pregnancy or wanted another pregnancy, is excluded in the present analysis. A fuller discussion of these planning types is given in Whelpton, P. K., and Kiser, C. V.: Social and Psychological Factors Affecting Fertility. VI. The Planning of Fertility. The Milbank Memorial Fund *Quarterly*, XXV, No. 1, January, 1947, pp. 63–111 (Reprint pp. 209–257). The "Quasi-Planned" are excluded on the basis of an analysis showing that this group is probably a mixture of two types: couples wanting the number of children they have and perhaps additional ones and couples properly belonging to the "Excess Fertility" category, but without any means of reliably separating the two types. (*See* Potter, R. G.: *The Influence of Primary Groups on Fertility*, Unpublished Ph.D. dissertation, Dept. of Social Relations, Harvard University, 1955, Appendix A.)

[6] The source for this estimate is Glass, D. V., and Grebenik, E.: The Trend and Pattern of Fertility in Great Britain, Part I: Report, PAPERS OF THE ROYAL COMMISSION ON POPULATION, Vol. VI, London, H.M.S.O. 1954, Table 26.

[7] Kantner and Potter, *op. cit.*, pp. 302 and 308. (Reprint pp. 1077 and 1083.)

of about .20. It is taken by the authors to mean that in the Indianapolis Study an adverse sampling scheme attenuates .20 correlations into nonsignificance. Because of the eligibility criteria employed, the couples tend to represent middleclass urbanites proficient in the use of contraception. Their parents, not directly subject to these eligibility criteria, represent a wider range of income and residence. Thus the sample contains a certain proportion of urban middle-class couples with rural or low-income parents. In this group the generational contrast in fertility is likely to be widest; and the inclusion of this group naturally reduces the fertility relationship between generations. At the same time couples of another type who might help to strengthen the fertility relationship between generations are automatically excluded. These are the nonmobile sons and daughters of rural and low-income parents, who on account of their nonmobility are more apt to retain their parents' high fertility.

For the same reason the sampling design must be taken as adverse for the fertility relationship between couples and siblings. It is possible to get into the sample urban, middle-class couples paired with rural and low-income siblings; but impossible to get the pairing of a rural and low-income couple with similar siblings. However, the force of this type of bias may be lessened by the fact that so many siblings have participated in the respondents' upward mobility or their cityward migration. Also siblings, belonging to a more recent generation, have participated that much more in the secular trend toward more efficient birth control.

There is another reason for expecting a stronger bond between the fertilities of siblings than between fertilities of consecutive generations. A respondent may react negatively to his family of origin and desire a family of very different size for himself. For example, the authors found a slight tendency for couples from very large families of origin to have smaller families than couples reared in families of moderate size.[8] If it ex-

[8] Kantner and Potter, *op. cit.*, pp. 302 and 307. (Reprint pp. 1077 and 1082.)

ists, a negative reaction of this type may tend to reduce the average relationship of parent-offspring fertility. Yet if this negative reaction is sufficiently shared by his brothers and sisters, it might actually contribute to the relatedness of their family sizes. Thus to some extent a factor that reduces a fertility relationship in the parents' case may at the same time enhance a relationship in the siblings' case.

However, a shared resolve to have small families cannot be achieved unless birth control is used with success. Accordingly any relationship between the fertility of couples and siblings should be stronger among "efficient planners" than among "inefficient planners," provided that socio-economic status is held constant. Without such a control couples and siblings might be related in their fertility simply because, being of similar status, they tend to be similar in contraceptive efficiency.

The reasons for expecting a relationship between fertility of friends and couples are multiple and, on the whole, more compelling. Friends are probably in a more strategic position than siblings or parents to influence ideals of family size. To be sure, couples exercise a right to choose their own family size. But their ideas are subject to influence regarding such matters as what size of family can be afforded on a certain income; what is a fair load on the wife; and many other pertinent values. Seemingly friends are in a good position to sway such ideas. The Warner school in sociology has stressed the clique's importance as a socializing agent in adult life. Then too, friends are often in closer contact with the couple than are siblings or parents. Several years of marriage may be required before the couple decide how many children they want. By this time the couple may be far removed from nearest relatives.

Yet one can easily overstress this idea that friends influence ideals of family size. In this report the term "friends" refers to three friends of the wife and presumably most of them are current friends. These friends may not be the most strategic ones, especially if the couple made their crucial fertility decisions years earlier.

Selective factors also play a part, perhaps a predominant one. Friends may be selected in a fashion that leads to related family sizes. For example, childless couples are apt to find that they have most in common with other childless couples and choose them as friends with disproportionate frequency. Small family size increases the chances that the wife will work for pay, usually with the work situation then bringing her into contact with other wives of low fertility. Over small areas housing tends to be homogeneous in rent and living space. This may reduce the chances that two couples similar in income but widely separated in family size will be neighbors.

There are several reasons, then, for expecting a relationship between the fertilities of couples and their friends. This fertility relationship should be stronger among "efficient family planners" provided that friends exercise an important influence upon the couples' family size ideals and provided that socio-economic status is held constant. Without adequate family planning, family size ideals cannot be implemented and influence counts for less.

Expectation that the fertility relationships will be independent of socio-economic status in the "efficient planner" sample and dependent in the "inefficient planner" sample follows from known relationships.[9] In the "efficient planner" sample socio-economic status has a negligible relationship with couples' fertility; and it is hard to anticipate anything different for its relationships with fertility of siblings or friends.[10] In the "in-

[9] The measure of socio-economic status used here is the "Summary Index of S.E.S." which is based upon the husband's occupation, his annual earnings since marriage, rental, net worth, purchase price of car, education of husband and wife, and the Chapin Social Status Scale. For a full description of this index, *see* Whelpton, P. K., and Kiser, C. V.: Social and Psychological Factors Affecting Fertility. IX. Fertility Planning and Fertility Rates by Socio-economic Status. The Milbank Memorial Fund *Quarterly*, XXVII, No. 2, April, 1949, pp. 188–244. (Reprint pp. 359–415.)

[10] The "efficient planner" sample includes both the "Number and Spacing Planned" and the "Number Planned." When just the "Number and Spacing Planned" are considered, the correlation between socio-economic status and couples fertility rises to .16. *See* Westoff, C. F. and Kiser, C. V.: Social and Psychological Factors Affecting Fertility. XXI. An Empirical Re-Examination and Intercorrelation of Selected Hypothesis Factors. The Milbank Memorial Fund *Quarterly*, XXXI, No. 4, October, 1953, p. 430. (Reprint pp. 953–968.)

efficient planner" sample, because adequacy of birth control decreases steadily with decreasing socio-economic status, there is a substantial relationship between socio-economic status and fertility of couples. Moreover, it seems highly plausible that the statuses of siblings and friends are closely related to the couples' statuses. As a result the fertility relationships of this sample should depend tangibly on the tendency of couples, siblings, and friends to be alike in socio-economic status and hence to be alike in contraceptive effectiveness and fertility.

Siblings' and Couples' Fertility

Siblings refer to "sociological" siblings rather than to "biological" siblings.[11] These are children reared in the same household with the respondent, though not necessarily born of the same parents. The ages of sociological siblings tend to be more closely grouped around those of the respondents. This tends to increase the homogeneity of childhood environments. It also means less variable marriage durations.

This second advantage is important because the chief problem connected with measuring fertility of siblings is their variable marriage durations. Obviously on the average more births can be expected of siblings married 20 years than of siblings married 5. But also on the average more births can be expected of four siblings each married 5 years than of one sibling married 20 years. One way of meeting these problems is to measure sibling fertility as a ratio, with the births of a sibling expressed as a ratio of the births expected of persons having his duration of marriage. This expected number of births is derived by using the fertility record of all siblings in the sample. The aver-

[11] "Sociological" siblings are defined as

(a) Full and half brothers and sisters within 10 years of the age of the wife (husband) provided that they were not separated from the wife (husband) by death or other reason before they reached 3 years of age or the wife (husband) reached 6 years of age.

(b) Step and adopted brothers and sisters within 10 years of age who shared the home throughout the time the wife (husband) was under 6, or for 3 years while she (he) was 6–16 (or an equivalent combination).

(c) Other children meeting the requirements of (2) and reared with the wife (husband) if the latter lived longest while 6–16 with nonrelatives (but not in an institution) or with other relatives than one or both parents.

age number of births per sibling in the first, second, third, and so on year of marriage is calculated and then these averages are summed for those specific years which fall within the marriage duration of the particular sibling. Of course, if the respondent has more than one married sibling, a ratio of observed to expected births may be computed for each sibling and then averaged.[12]

Siblings and couples may be related in their fecundities, or physiological capacities to reproduce. It follows, then, that the presence of many siblings and couples whose fertility is determined only by fecundity would cloud the meaning of any relationships found between their fertilities. To minimize this problem, the "relatively sterile" couples have been excluded. The sample of siblings cannot be refined in the same way. As a substitute for direct refinement, siblings and associated couples are excluded if the married siblings in question have not had at least one birth. Such a procedure excludes some voluntarily childless siblings, but removes most of the extremely infecund siblings as well. Besides the elimination of couples without married siblings, this cuts sample size by approximately one-third.

Results for the "efficient planners" are first examined. Fer-

[12] This measure is more easily described with symbols. For each year of marriage —first, second, third, and so on—an average number of live births per sibling is calculated from the experience of all married siblings. Denote these average fertilities as x_i, $i = 1, 2, 3, \ldots$. Analogously the live births observed for a given sibling may be denoted as f_{ij}, $i, j = 1, 2, 3, \ldots$ where i again stands for the ordinal year of marriage duration and j identifies the sibling. Then the measure of fertility for a respondent's siblings is simply

$$\sum_j \left(\sum_i f_{ij}\right) \Big/ \sum_j \left(\sum_i x_i\right)$$

where x and f are summed over the full length of marriage of each married sibling and these totals are then summed over the total number of married siblings which the respondent has. One additional remark should be made. Instead of the x_i, coders of the Indianapolis Study used as their expected fertilities $y_i = 10\ (x_i/x_{10})$. Their final measure of the fertility of a respondent's siblings is

$$\left\{ \sum_j \left(\sum_i f_i\right) \Big/ \sum_j \left(\sum_i y_i\right) \right\} \div x_{10/10}$$

This formula may be simplified by cancelling terms to obtain the formula cited above. Thus:

$$\frac{\sum_j \left(\sum_i f_i\right)}{10 \sum_j \left(E x_i / x_{10}\right)} \times \frac{10}{x_{10}} = \frac{\sum_j \left(\sum_i f_i\right)}{\sum_j \left(\sum_i x_i\right)}$$

tility of wife's siblings yields a correlation of .25 (N = 230) with fertility of couples. The corresponding correlation for fertility of husband's siblings is .22 (N = 231). Neither relationship gives evidence of nonlinearity.

Fertility distributions are typically skew, with the lowest fertility values naturally stopping at zero but with the highest values free to spread out. By employing square roots instead of the original fertility values, distributions are obtained which come much closer to the assumptions usually made in significance tests. Under these conditions the fertility correlations between couples and husbands' siblings and between couples and wives' siblings are .15 and .25 respectively, with a correlation of approximately .15 needed to reject, at a .95 confidence level, the hypothesis that the two sets of fertility are unrelated.

As anticipated, relationships are not reduced when socio-economic status is held constant. Among the "efficient planners" much the same fertility is exhibited in the various socio-economic strata; and the same is true for siblings. The two lowest strata (N = 40) are exceptions since their couples show a sharp increase in family size. However, it may be doubted whether this is an authenic rise in size of planned family. The separation between "efficient" and "inefficient" family planners becomes very uncertain in these lowest strata. Accordingly they are left out of the analysis summarized in Table 1.

Among "inefficient planners" the relationships between sibling fertility and couple fertility remain very low but do not

Table 1. Coefficients of correlation[1] between fertility of efficient family planners and the siblings of husband or wife.

Partial Controls (1)	"Sociological Siblings" of Wife (N = 200)[2] (2)	"Sociological Siblings" of Husband (N = 202)[2] (3)
No Control	.21	.11
Socio-Economic Status	.21	.12

[1] Fertility values are converted into their square roots.
[2] Excluded are the two lowest socio-economic status divisions. Needed to reject p = 0 with .95 confidence when N = 200 is a correlation coefficient of about .15.

vanish. Coefficients of .15 are evinced both in the cases of the wife's siblings and her husband's. Such coefficients put the relationships on the border of .05 significance. Both relationships appear to be linear.

However, both relationships collapse when socio-economic status is held constant (*see* Table 2). Very probably siblings and couples are closely related in their socio-economic statuses and the .43 correlation which couples exhibit between their family sizes and their socio-economic status is repeated among siblings.

Friends' and Couples' Fertility

Much stronger relationships are found between the fertilities of couples and friends than between the couples and siblings discussed above. In both the "efficient planner" and "inefficient planner" samples the correlation is approximately .40. Before considering these relationships in detail, something should be said about measurement.

In the next paragraphs the term "friends" refers to three married friends of the wife. No restrictions were imposed on the wife concerning her choice of married friends. Thus a friend might be a next door neighbor or a distant childhood chum with whom she has kept in touch by mail. But it seems reasonable to assume currentness of contact and geographical proximity in most cases. Also, a friend may be married a longer or shorter time than the wife, with her family size naturally affected. However to the extent that friendship cliques are age-graded, the marriage durations should tend to be homogeneous.

Table 2. Coefficients of correlation[1] between fertility of inefficient family planners and the siblings of husband or wife.

Partial Controls (1)	"Sociological Siblings" of Wife (N = 206) (2)	"Sociological Siblings" of Husband (N = 210) (3)
No Control	.15	.15
Socio-Economic Status	.05	.10

[1] Fertility values are converted into their square roots. Needed to reject p = 0 with .95 confidence when N = 200 is a correlation coefficient of about .15.

The wives' fertility is measured in terms of live births; their friends' fertility in terms of living children. Had the latter measure also been applied to the wives, the correlations between fertility of wives and friends more likely would have been higher rather than lower than the ones to be examined. To the extent that selective factors operate in these correlations, they operate in terms of living children, not live births. However, the issue almost certainly is a secondary one, since a comparison of the wives' distributions of live births and living children shows them to be very similiar.[13]

One further remark about measurement should be made. The fertilities of wife's friends were not reported individually in the study. Only a single figure giving the total number of living children of the three friends was required. If the wife reported on only two friends, their total fertility was multiplied by 1.5. If she reported on only one friend, her answer was not used. As expected the reports usually relate to three friends. This means that an extreme family size of one friend tends to be averaged toward a more median value by the fertilities of the other two friends. Undoubtedly this feature raises the fertility correlation between friends and couples over what it would be if wives reported on only one friend. Chances are greatly diminished that wife and friends both will have extreme family sizes. This is important because when these extremes are opposite, they contribute relatively huge deviations to the standard error of estimate.

Among "efficient planners" the fertility correlation between wives and their friends is .37(N = 337). Again fertility values are converted into their square roots in order to obtain better shaped distributions.) The relationship shows no evidence of nonlinearity. As expected, it is not reduced when socio-economic status is held constant (Table 3).

Of special interest is whether among the "efficient planners" childless wives select other childless wives as friends more often

[13] Whelpton, P. K., and Kiser, C. V.: Social and Psychological Factors Affecting Fertility. VI. The Planning of Fertility. The Milbank Memorial Fund *Quarterly*, XXV, No. 1, January, 1947, p. 63. (Reprint, p. 232.)

than do wives with children. This cannot be answered directly. Information on the fertility of wife's three friends is restricted to a single figure stating their total number of children. However, if three friends total two or fewer children, then one or more of them are without children. Proportions of such cases can be calculated and then compared for wives with 0, 1, 2, and 3 or more children. The results, starting with childless wives, are 40 per cent, 22 per cent, 8 per cent, and 12 per cent—this for sample sizes of 88, 77, 106, and 66. The evidence is clear that among the "efficient planners" childless wives report friends without children more often than do wives with children.

Among "inefficient planners" the fertilities of wives and their friends show a correlation of .40(N = 268). Again the relationship appears to be linear; and it manifests no signs of attenuation among wives with large or small families.

A coefficient of .40 puts it a shade above the corresponding correlation in the "efficient planner" subsample. The slight edge is specious, however. The two coefficients cannot be compared directly with each other, since in the "inefficient planner" sample the variance of couples' fertility is 38 per cent greater than the variance of the couples' fertility in the "efficient planner" sample. If the coefficient in the "inefficient planner" sample had a standard error of estimate no larger than the standard error of estimate in the "efficient planner" sample, the "inefficient planner" coefficient would be nearer .60 than .40. No special assumptions are required for this calculation.[14]

Table 3. Coefficients of correlation between fertility of couples and average fertility of wives' three friends, by family planning status of couples.[1]

Partial Controls (1)	Efficient Family Planners (N = 297)[2] (2)	Inefficient Family Planners (N = 268)[2] (3)
No Controls	.38	.40
Socio-Economic Status	.38	.31

[1] All fertility values are converted into their square roots.
[2] Excluded are the two divisions of lowest socio-economic status (N = 40). Needed to reject p = 0 at a .95 level of confidence, when N = 260, is a correlation coefficient of about .13.

[14] Let the subscripts e and i distinguish whether a statistic belongs to the

(Continued on page 260)

The families of "inefficient planners" increase in size as one descends the socio-economic scale. The tendency is marked enough to give a correlation of –.43 between socio-economic status of wives and their fertility. Wives and friends are closely related in their statuses so that there is even a correlation of –.30 between fertility of friends and wives' socio-economic status. Thus the fertility tie between wives and friends depends partly on a similarity of socio-economic status together with the tendency of fertility to increase as socio-economic status decreases. The degree of this dependence turns out to be about 40 per cent. When socio-economic status is held constant, the correlation between fertilities drops from .40 to .31. This means a reduction to $.31^2/.40^2$ or .60 in the proportion of fertility variation originally accounted for.

Part of the reason why the fertility relationship depends on socio-economic status is that effectiveness of contraception is directly associated with socio-economic status. This can be demonstrated quite directly. The number of pregnancies unwanted by husband and the number of pregnancies unwanted by wife are recorded. The correlation between these unwanted pregnancies and the couples' fertility is .55. That is, about 35 per cent of the fertility variation of the "inefficient planners" can be accounted for in terms of unwanted pregnancies. Moreover, number of unwanted pregnancies is to a substantial extent inversely correlated with socio-economic status, the correlation being –.30. In summary, the relationship between fertility of wives and fertility of wives' friends drops about 40 per cent when socio-economic status is held constant. Part of the reason for this dependence is the familiar fact that socio-economic status is closely related to effectiveness of contraception and this in turn accounts for an important fraction of the variation in family size.

"efficient planner" or "inefficient planner" sample. No arbitrariness is introduced if s_o^2 is assigned a value of 1. Then $s_i^2 = 1.38$. r_o is .37. Its square, r_o^2, will be defined as $1-s_u^2/s_o^2$ which means that $.14 = 1-s_u^2$ or that $s_u^2 = .86$. Now suppose that s_u^2 takes the same value of .86 in the "inefficient planner" sample with its $s_i^2 = 1.38$. Then hypothetical $r_i^2 = 1-.86/1.38$ or approximately .38, the square root of which gives r_i as approximately .62.

Role of Qualifying Factors

The influence of a primary group on fertility is not automatic. The types of social relationships between couples and members of a particular primary group vary enormously. Undoubtedly this variation affects the likelihood that a primary group will influence the size of family preferred by the couples. To test this supposition in relation to friends, the couples may be variously classified according to their relationships with their friends. Each set of subgroupings which results from such a classification then is examined for evidence of differing levels of influence. That is, fertility correlations between wives and wives' friends are calculated in each subgroup and their rank order compared with expectation.

This extension of the analysis actually has been carried out. Relationships have been classified along such dimensions as: feeling of luckiness about friends, frequency of contact with friends, residential mobility, perception of own finances as compared with friends', social mobility of couples, and others. The analysis has been restricted to "efficient planners" since inadequate family planning could only obscure the comparisons.

Results have proved negative. Three factors may have contributed to this outcome. The classifications of social relationship are few and crude. This is not surprising, since the data were not collected with this type of classification in mind. Nor has it been possible in any classification to hold constant more than one factor. Ideally the bearing of differing kinds of social relationship is investigated only when some control has been achieved over such aspects as frequency of contact, uniformity of family size among friends, and the presence or absence among friends of extreme family sizes. Finally, there is no justification for expecting qualities of social relationship to give differing fertility correlations between couples and their friends, unless the influencing of family size ideals by friends is an important component in these correlations. It may be that these correlations depend on selective factors. If so, a negative outcome is virtually inevitable.

Perception of Economic Situation	Pertaining to Husband's Perception		Pertaining to Wife's Perception	
	Percentage Having More Children than Wife's Friends	Sample Size	Percentage Having More Children than Wife's Friends	Sample Size
(1)	(2)	(3)	(4)	(5)
Perceive Having Less to Spend than Friends	46	111	44	112
Perceive Having About the Same to Spend	36	146	38	161
Perceive Having More to Spend than Friends	35	80	33	64
Total	40	337	39	337

Table 4. Among "efficient planners" percentages having more children than wife's friends, by husband's and wife's perception of their income situation as compared with their friends'.

One result merits specific notice. Husbands and wives are asked, "During most of your married life have you had as much to spend as most of your friends?" The answers are fairly evenly divided among "having less," "the same," and "more money to spend."

One characteristic of couples perceiving that they have less money to spend than do their friends is a feeling of economic insecurity.[15] This makes sense, since friends afford the readiest benchmark of economic adequacy. But this specific group of couples also has a distinctively high proportion of wives having more children than the average for their three friends. This is surprising because of the association between low fertility and low economic security.[16]

Probably this association is overshadowed by another. Among couples of similar income, those who see themselves with more children can honestly say that they have less money to spend on many things, especially of a recreational

[15] Economic security is measured here by the "summary index of economic security" used in Kiser, C. V. and Whelpton, P. K.: Social and Psychological Factors Affecting Fertility. XI. The Interrelation of Fertility, Fertility Planning, and Feeling of Economic Security. The Milbank Memorial Fund *Quarterly*, XXIX, No. 1, January, 1951, pp. 112–114. (Reprint pp. 538–540.)

[16] Ibid. (Reprint pp. 495 ff.)

nature. In corroboration, Table 4 indicates that spouses who perceive having less to spend are selected toward having a higher fertility than their friends.

Summary

The relationships between the couples' fertility and the fertilities of husbands' or wives' siblings are very weak. In the sample of "efficient family planners" they barely reach statistical significance. Among "inefficient family planners" they do not exist independently of socio-economic status. Relationships equal to those found could be expected between any two groups having statuses as closely related as those of the couples and their siblings.

A much stronger bond exists between fertility of couples and fertility of wives' three friends. A correlation coefficient of .37 is met in the "efficient planner" subsample and is maintained within socio-economic strata. This apparently linear relationship holds up well at both extremes of couple fertility. Childless wives, more often than wives with children, report as friends women without living children. Wives having three or more children report friends of higher fertility than do wives with two children.

Unexpectedly the fertility correlation between couples and wives' friends is just as high in the "inefficient planner" sample, standing at about .40. One reason for this surprising result is mechanical: the family sizes of couples are 38 per cent more variable in the "inefficient planner" sample than in the "efficient planner" sample. The relationship also depends partly on the fact that couples and friends tend to be similar in socio-economic status and therefore in effectiveness at birth control. The amount of variation in couple fertility which can be accounted for in terms of fertility of wives' friends is reduced 40 per cent when socio-economic status is held constant.

Interpretation

Probably even in an unrestricted sample the correlation between fertility of couples and fertility of their siblings would

be low. It seems unlikely that siblings wield much influence upon each other's ideals of family size. Nor do shared reactions to a family of upbringing seem to be the basis for a substantial fertility relationship. Then too, the awkward way in which sibling fertility had to be measured contributes toward weaker relationships. To allow for differing marriage durations, sibling fertility must be measured as a ratio of observed to expected fertility. Unfortunately these ratios are sensitive to a number of factors, as the following example shows. Think of a couple who want two children; have them in the first two years of marriage; but stop there. If their fertility is measured at the end of this second year, their rating will be well above two other types of couple who also stop at two children: namely the couples who space their two children more widely and secondly the couples who have their two children in the first two years of marriage but whose fertility is not measured until several years of marriage have elapsed. Naturally this looseness between measured fertility and actual completed size of family tends to attenuate fertility relationships.

The fact remains, however, that in the "efficient planner" sample the fertility relationships between fertility of couples and that of siblings reach statistical significance while the relationships involving parents do not.[17] For interpretation little can be done except to repeat a rationale given earlier. It is improbable that the difference arises solely because siblings wield greater influence upon family size ideals than parents. Some fraction of the couples have reacted negatively to the size of their families of upbringing. These negative reactions tend to weaken the fertility relationship between generations. But if these negative reactions are sufficiently shared by brothers and sisters, then they should enhance, not reduce, the fertility relationships between siblings.

This supposition gathers support from the contrasting results in the "efficient planner" and "inefficient planner" subsamples. If the fertility relationship between couples and sib-

[17] Kantner and Potter, *op. cit.*, p. 302 (Reprint p. 1077.)

lings depends primarily on shared reactions to families of origin, then it should diminish among couples whose birth control is so inadequate that they cannot implement their common goals. When socio-economic status is held constant, the relationship actually does dwindle among the "inefficient planners."

Seemingly the fertility relationship between couples and wives' friends has a multiple basis. Friends are in a strategic position to influence family size ideals. Couples of similar fertility are apt to find more in common and to seek each other out as friends. Principles of nonpurposive selection may also operate. Couples of like fertility are led into unintentional association by similar housing needs and common activities, with propinquity then favoring the formations of friendships.

From the data at hand, it is impossible to say which principle contributes the most. One cannot decide whether influences upon family size ideals play a primary or secondary role in the overall relationship. Nevertheless there are several reasons for believing that the principles of purposive and nonpurposive selection together have an important, if not predominant, role.

(1). The main reason for suspecting that selection plays a large part in the relationship of couples' fertility and friends' fertility is the persistence of the relationship in the "inefficient planner" sample. To be sure, it shrinks when proper account is taken of the wider variation in fertility and of the partial dependence of the relationship on socio-economic status. Nevertheless a sharper shrinkage would be expected if the relationship depended heavily upon wives being influenced by their friends. Such influences forfeit much of their power among couples unable to practice efficient birth control.

(2). Evidence has been provided that childless wives tend to have childless wives as friends. It is a little far-fetched to think of a newly married wife coming into the company of several childless wives and then being "influenced" to remain childless herself. It is much easier to think of wives coming together on the basis of common interests that are partly conditioned by the absence of children.

(3). Finally there is the consideration that "friends" in this report doubtless refers in the main but not necessarily to three *current* friends of the wife. Current friends may not be the crucial ones from the standpoint of influencing fertility. This would be especially true for couples who made their basic fertility decisions much earlier.

Recommendation for Future Studies

How best may the study of primary group influence upon fertility be advanced? The present report has examined fertility correlations between respondents and their siblings and friends. These correlations are difficult to interpret. For example, how much does the relationship between fertility of siblings and couples depend on mutually influenced ideals of family size and how much upon shared reactions to families of upbringing? It is no easier to tell whether the relationship between fertility of friends and couples rests on friends influencing size preferences or on the tendency of persons with similar family sizes to meet and choose each other as friends. Because of this difficulty, merely duplicating studies like the present one on other samples is not enough.

More direct studies are needed of the ways in which primary groups influence fertility. Before such studies can proceed very far, however, more must be known about family size ideals and their processes. A couple may take years to reach the final and effective decision as to how many children they want. The processes by which vague, tentative ideas about family size grow into firm, highly rationalized goals ought to contain many regularities. Hitherto these regularities have not been studied systematically. Suited for such study would be a panel design, permitting trends to be followed over time. The sample of couples should cover a range of marriage durations, so that these trends may be checked against hypotheses for various marriage points.

Ideals of family size have a long time reference. Not only are they changing through time, but also the influences playing upon them are changing. Therefore subtle means are required

to isolate the influence of any one group. The most successful measures may be indirect ones—e.g., asking for examples of "successful families" from among the respondent's relatives or near acquaintances. Special situations may provide the largest yields in terms of results. Among these situations might be spouses in disagreement over their family plans or spouses exposed to conflicting advice. In general, there seems to be an important area of study here, but a very difficult one. Considerable ingenuity will be demanded.

SOME DEMOGRAPHIC MEASUREMENTS FOR EGYPT BASED ON THE STABILITY OF CENSUS AGE DISTRIBUTIONS

M. A. EL-BADRY[1]

INTRODUCTION

THERE is clearly some relation between the relative sizes of successive age groups in a population and the risks of death. When, for a considerable number of years, the population has been closed to migration and the age schedules of fertility and mortality have been relatively constant, the rate of growth of the population is also relatively constant and the proportional distribution of the population by age assumes a relatively fixed character known as "stable." These relations will be considered below. For the time being the essential point to note is that under such circumstances if the age of the population is accurately counted, it is a simple matter to compute the risks of death implicit in the age distribution.

It is the purpose of this paper to utilize the near stability of the Egyptian age distributions from 1907 to 1947 to obtain a life table and certain other measures of mortality and fertility. Before doing so, however, it will be necessary (1) to show that the age distribution is indeed approximately stable and (2) to correct the most obvious distortions in the census reporting of age. With this accomplished we can proceed to construct a life table representing the mortality conditions in Egypt during the period 1907–1947 and utilize the stability of demographic conditions to secure some measures of fertility as well.

THE STABILITY OF THE DEMOGRAPHIC CONDITIONS IN EGYPT

If we confine ourselves to the crude birth rate as a measure of fertility in order to avoid the distortions which result from the erroneous age reporting of mothers, we find that this rate fluctuated haphazardly without any indication of a downward

[1] From the Office of Population Research, Princeton University.

trend between 1917 and 1946. The birth rate was 40.1 in 1917 and 42.7 in 1946 and the average rates in the intervals 1917–1926, 1927–1936, and 1937–1946 were 41.8, 43.6, and 41.7 respectively. It is true that the available birth rates are below reality because of under-reporting of births, especially in the areas without health bureaus; but it is also true that no indication of declining fertility can be traced in the incomplete data available. In fact, it seems very unlikely that there has been any considerable change in the people's customs regarding fertility, except perhaps among limited classes in the urban areas.

The situation is the same in the case of mortality, where the average crude death rates over the periods 1917–1926, 1927–1936, and 1937–1946—again deficient because of under-reporting—have been constant and equal to about 27.0.[2] (There has been a consistent downward trend in the death rates since 1946 but this is irrelevant to our discussion.)

The population can also be considered as "closed," since there has been virtually no emigration on the part of Egyptians and the movements of foreigners can have only a trivial effect on the age distribution of the population because, as can be seen from the accompanying table, they make up a very small percentage of total numbers.

Year	*No. of Foreigners*	*Proportion of Total Population Per Cent*
1927	225,600	1.6
1937	186,515	1.2
1947	146,001	.8

The stability of fertility and mortality and the negligible amount of migration in the period 1907–1947 is also illustrated by the great similarity between the reported age distributions for both males and females as shown by Tables 1 and 2 and

[2] In computing the average for 1917–1926, the effect of the 1918 influenza epidemic was eliminated. The death rate rose from 29.4 in 1917 to 39.6 in 1918 and then dropped back to 29.4 in 1919.

Table 1. Population age distribution by decennial age intervals (in thousands).

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100 and Over	Total
A. MALES												
1907	1,664	1,200	816	740	509	688						5,617
1917	1,771	1,407	924	853	575	377	230	139	55	21		6,352
1927	1,937	1,545	1,099	991	664	392	245	120	47	15	3	7,058
1937	2,135	1,748	1,159	1,161	822	476	274	128	46	14	4	7,967
1947	2,495	2,132	1,367	1,283	1,000	594	337	132	40	12		9,392
1947[1]	2,378	2,032	1,303	1,223	953	566	321	126	38	11		8,951
B. FEMALES												
1907	1,678	942	918	757	515	763						5,573
1917	1,797	1,182	1,043	875	571	378	263	142	72	27		6,350
1927	1,964	1,338	1,234	1,017	657	411	275	138	64	18	4	7,120
1937	2,192	1,515	1,261	1,178	787	471	305	151	68	21	5	7,954
1947	2,505	1,995	1,498	1,348	985	624	382	162	58	18		9,575
1947[1]	2,343	1,866	1,401	1,261	921	584	357	152	54	17		8,956

[1] Adjusted for over-reporting. (*See* text.)

Table 2. Reported proportional age distributions.

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100 and Over	Total
A. MALES												
1907	2,962	2,136	1,453	1,317	906	1,225						9,999
1917	2,788	2,215	1,455	1,343	905	594	362	219	87	33		10,001
1927	2,744	2,189	1,557	1,404	941	555	347	170	67	21	4	9,999
1937	2,680	2,194	1,455	1,457	1,032	597	344	161	58	18	5	10,001
1947	2,657	2,270	1,456	1,366	1,065	632	359	141	42	13		10,001
B. FEMALES												
1907	3,011	1,690	1,647	1,358	924	1,369						9,999
1917	2,830	1,861	1,643	1,378	899	595	414	224	113	43		10,000
1927	2,758	1,879	1,733	1,428	923	577	386	194	90	25	6	9,999
1937	2,756	1,905	1,585	1,481	989	592	383	190	85	26	6	9,998
1947	2,616	2,084	1,564	1,408	1,029	652	399	169	60	19		10,000

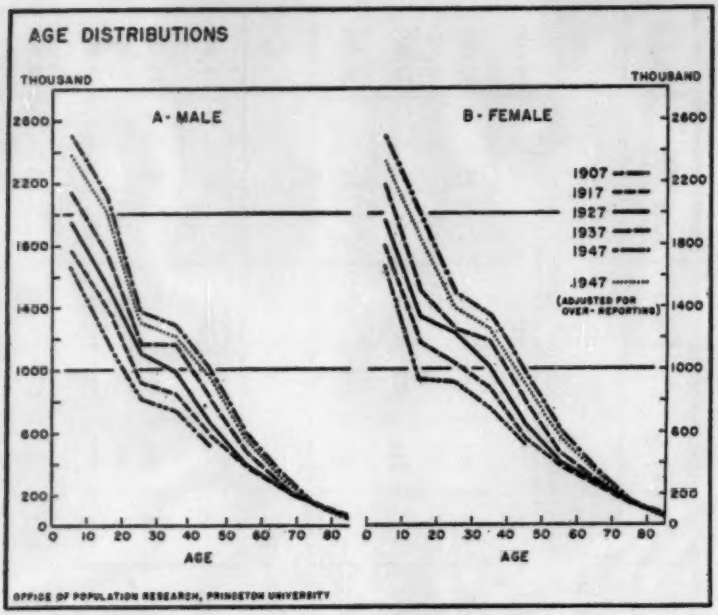


Fig. 1. Reported age distributions, by sex, 1907–1947.

Figures 1 and 2. Apart from a systematic improvement in the reporting of children within the age groups 0–9 and 10–19, which will be demonstrated later, and a systematic reduction in the over-estimation of old ages, the age distributions remain practically unchanged. They do exhibit, however, the effect of an unusually large cohort aged 0–9 in 1907 which maintains outstandingly high proportions from 1907 through 1947 among both males and females, as can be seen clearly from Table 2 and Figure 2. The fact that this cohort can be so readily identified in each of the five censuses itself tends to support the assumption of the stability of the age distribution throughout this period and testifies to the underlying accuracy of the census reports once they are corrected for systematic biases. In addition, the five censuses gave approximately stable growth rates during 1907–1937; the stability is broken only by the over-enumerated 1947 census, as will be shown in the next section.

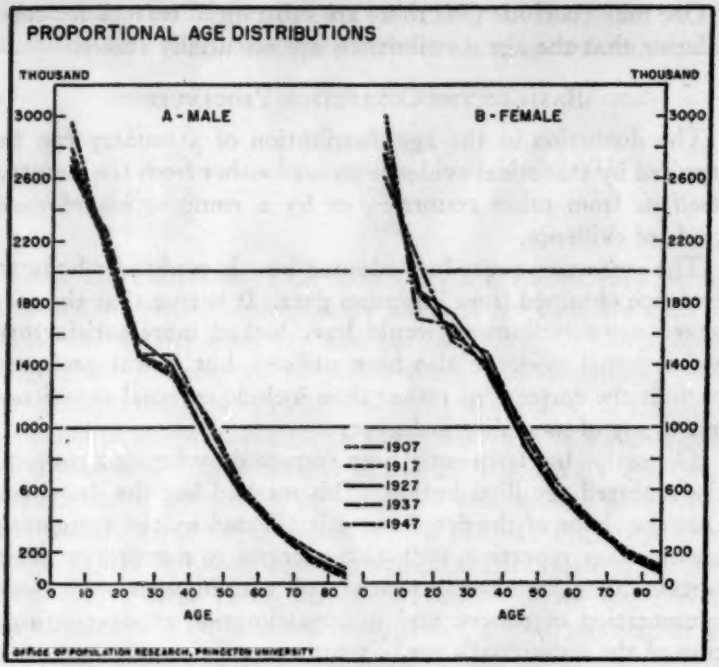


Fig. 2. Reported proportional age distributions, by sex, 1907–1947.

The fixed nature of mortality risks and the triviality of migration (two of three necessary components of a stable age distribution) can be seen from a simple measure like the ratio of the population aged 20 and over to the whole population 20 years earlier. (Age 20 was preferred to age 10 to avoid the above-indicated systematic shift from the age group 0–9 into the group 10–19.) These ratios are found to be practically constant:

Year	*Males*	*Females*
1927	.637	.685
1937	.643	.669
1947*	.643	.667

*The 1947 proportions were calculated after correcting for over-reporting in 1947 as will be shown in the following section.

One may conclude that there are substantial reasons for considering that the age distributions are essentially stable.

Basis of the Correction Procedure

The distortion in the age distribution of a country can be repaired by statistical evidence secured either from the country itself or from other countries, or by a combination of such kinds of evidence.

The correction procedure adopted here is confined wholly to evidence obtained from Egyptian data. It is true that the corrected age distributions would have looked more satisfactory had external evidence also been utilized, but it was preferred to limit the corrections rather than include external experience in a study of mortality in Egypt.

Distortion has frequently been corrected by fitting a curve to the reported age distribution. This method has the drawback that the shape of the fitted curve is affected by the systematic errors in age reporting, such as tendencies to mention or avoid certain ages, under-enumeration of certain ages and over-enumeration of others, and under-estimation or over-estimation of the individual's age.

Instead of this method, we shall apply here a procedure which secures indicators of necessary corrections from the five census age distributions along with evidence obtained from Egyptian statistics illustrating the practically unchanged mortality and fertility conditions in Egypt in 1907–1947 and the triviality of migration. This procedure will lead us to five essential corrections necessitated by the following systematic biases:

(1). Over-reporting in 1947.
(2). Erroneous reporting of children aged 10–19 as being in the 0–9 age group.
(3). Erroneous reporting of males 20–29 as 10–19.
(4). Under-estimation of females aged 40–59.
(5). Over-estimation of old ages.

Adjustment of Over-Reporting in the 1947 Census

The 1947 census gave total population figures which consid-

erably exceeded expectations, especially in the case of the females. This can be seen from the table of growth rates:

Interval	*G.R. of Males*	*G.R. of Females*
1907–17	.012	.013
1917–27	.011	.011
1927–37	.012	.011
1937–47	.016	.019

This sharp increase in the 1947 growth rates can only be attributed to over-reporting since there is no evidence that it has been accompanied by changes in mortality, fertility, or migration. In fact, the large difference between the relative increases in the growth rates of females and males suggests the existence of over-reporting. This over-reporting was stimulated by a rationing census undertaken in 1945 which gave a total population of 24 million, or six and a half million over what one would expect on the basis of the 1927–1937 growth rate.

To adjust for this over-reporting, a continuation of the 1907–1937 growth rates, namely .01165 for males and .01186 for females, will be assumed here, giving a 1947 population of 8,951,000 males and 8,956,000 females—i.e. an over-reporting amounting to one million, or 5.6 per cent. It will also be assumed here that the degree of over-reporting is constant among the various age groups. There is certainly some error in this assumption, the effect of which would be negligible compared to the other distortions existing in the age distribution. The assumption was found to be satisfactory, however, in that it gave sex ratios in the various age groups which were consistent

Table 3. Reported sex ratios (males per female).

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90 and Over
1907	.991	1.274	.889	.977	.989					
1917	.986	1.190	.886	.975	1.007	.997	.875	.979	.764	.778
1927	.986	1.155	.891	.974	1.011	.954	.891	.870	.734	.817
1937	.974	1.154	.919	.986	1.044	1.011	.898	.848	.676	.692
1947	.996	1.069	.913	.952	1.015	.952	.882	.815	.690	.667
1947[1]	1.015	1.089	.930	.970	1.035	.969	.899	.829	.704	.647

[1] Adjusted for over-reporting. (*See* text.)

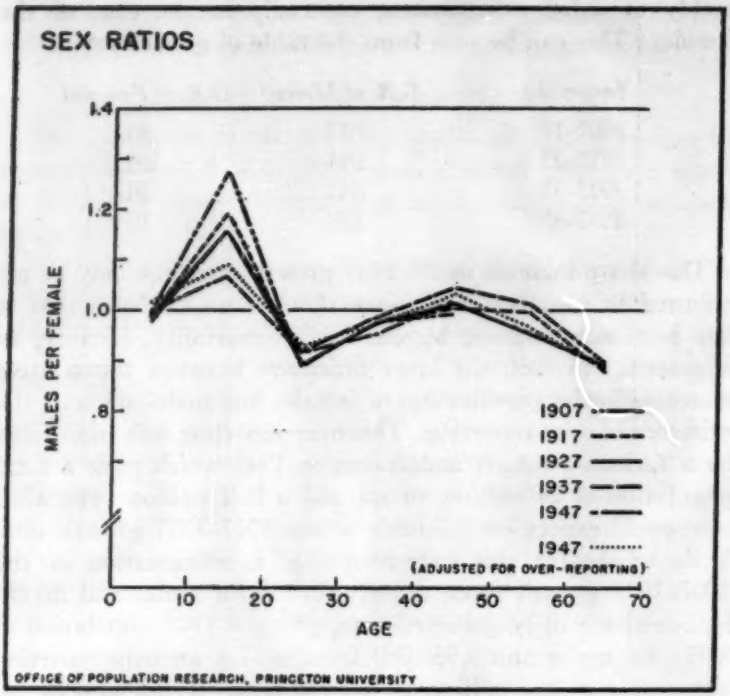


Fig. 3. Reported sex ratios, 1907–1947.

with the corresponding values calculated from the preceding censuses, as can be seen from the last row in Table 3 and from Figure 3. The slightly higher sex ratio in the group 0–9 and lower sex ratio in the group 10–19 in the adjusted census compared to the earlier censuses are due to the fact that the ratios given by the preceding censuses still need correction for erronous reporting of children aged 10–19 as being in the 0–9 group. The plausibility of the adjusted frequencies is also illustrated by the fact that the cohort survival rates of the various groups from 1937 to 1947 (Table 4) are much nearer to the averages of the corresponding rates in the preceding censuses than the high rates given by the reported 1947 data. This is a direct result of the reduction of the 1947 frequencies.

Table 4. Reported cohort decennial survival rates.

Interval	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89
				A. MALES					
1907–1917	.846	.770	1.045	.777	.741				
1917–1927	.872	.781	1.073	.778	.682	.650	.522	.338	.327
1927–1937	.904	.750	1.056	.829	.717	.699	.522	.383	.383
1937–1947	.999	.782	1.107	.861	.723	.708	.482	.313	.196
1937–1947[1]	.952	.745	1.055	.821	.689	.674	.460	.297	.196
				B. FEMALES					
1907–1917	.704	1.107	.953	.754	.734				
1917–1927	.745	1.044	.975	.751	.720	.728	.525	.451	.306
1927–1937	.771	.942	.955	.774	.717	.742	.549	.493	.406
1937–1947	.910	.989	1.069	.836	.793	.811	.531	.384	.221
1937–1947[1]	.851	.925	1.000	.782	.742	.758	.498	.358	.206

[1] Adjusted for over-reporting in 1947. (*See* text.)

Naturally the proportional age distribution, upon which most of the following discussion is based, will not be altered by this adjustment. The adjusted 1947 frequencies are shown in the last rows of Tables 1(A) and 1(B).

Correction of Female Frequencies Under 20 Years of Age

The discussion in this article is confined to ten-year age groupings in order to avoid some of the distortions resulting from the digit biases on the part of the respondents. The only available single-year age distribution, that of the 1927 census, reveals not only a concentration on ages ending with zero and five and a preference for even ages, but also outstanding popularity of certain middle ages. In that census the first ten most frequent ages were:

Males: 35, 30, 25, 40, 12, 10, 8, 0, 50, 15
Females: 30, 25, 40, 35, 20, 50, 8, 10, 0, 12

in which the ages of 35, 30, 25, 40 take leading positions and age 8 outnumbers all ages from 0 to 9.

Now the female proportional age distributions [Table 2(B)] show that:

(a). The proportion of females under 20 years of age has been practically constant, ranging unsystematically between 46.4 per cent and 47.0 per cent.

(b). The proportion of the group 0–9 had a consistent downward trend while that of the group 10–19 maintained a consistent upward trend.

(c). These trends are toward reducing the distortion in the age distribution that existed at the mid-value of the group 10–19 from 1907 through 1937 and which has disappeared in 1947, as can be seen from Figure 2(B), in which the line for 1947 is free from the trough which existed at age 15 in the other censuses.

(d). Table 4(B) also shows cohort decennial survival rates[3] which are too low for the group 0–9 and absurdly high rates for the group 10–19, with a consistent upward trend in the rates of the first group accompanied by a consistent downward trend among those of the second group.

[3] The cohort decennial survival rate for the group aged 0–9 in 1907, for example, is defined as the ratio of the group 10–19 in 1917 to the group 0–9 in 1907.

It is not possible to account for these relations in terms of decreasing fertility or increasing mortality, or increasing underenumeration of children under 10. Therefore, one would be justified in assuming the existence of an increasingly accurate reporting of age from one census to the next, within the first two age groups. In this situation a sensible procedure would be to adopt the 1947 proportions in these groups as the most plausible.

To correct for this systematic improvement the excess in the 0–9 female proportions over that of 1947 will be shifted into the 10–19 group. This will be done for all of the censuses except 1907 which, as we noted above, has an extraordinarily large cohort 0–9. In that case it is perhaps more plausible to allow for the cohort size as follows: (1) A straight line is fitted to the 1937, 1927, and 1917 reported proportions through the 1947 proportion; (2) the 1907 proportion is estimated from this straight line; (3) the excess of this estimated proportion over the 1947 proportion is then shifted into the 10–19 group in 1907. The frequencies and proportions thus obtained will be as given in the first two columns of Tables 5(B) and 6(B).

As can be seen by comparing the first two columns of Tables 4(B) and 8(B), this correction improves the decennial survival rates of the first two age groups by increasing the rates of the 0–9 group and decreasing those of the group 10–19.

The new proportions and frequencies straightened out the trough which existed at age 15 in both the frequency and the percentage curves and also were consistent with the 20–29 points on both curves. We will therefore not endeavor to undertake further correction in the 20–29 female group.

Correction of Male Frequencies in the First Three Age Groups

The situation is more complicated in the case of the males. Here we notice again [Table 2(A) and Figure 2(A)] the existence of a downward trend in the proportions of the group 0–9 similar to that of the females and an upward trend in the group

Table 5. Corrected age distributions (in thousands).

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100 and Over	Total
A. MALES												
1907	1,579	1,151	950	740	509	688						5,617
1917	1,694	1,345	1,063	853	575	377	230	139	55	21		6,352
1927	1,882	1,453	1,246	991	664	392	245	120	47	15	3	7,058
1937	2,125	1,643	1,274	1,161	822	476	274	128	46	14	4	7,967
1947	2,387	1,900	1,426	1,223	953	566	321	126	38	11		8,951
B. FEMALES												
1907	1,508	1,112	918	753	519	763						5,573
1917	1,661	1,318	1,043	861	581	382	263	142	72	27		6,350
1927	1,863	1,439	1,234	1,002	672	411	275	138	64	18	4	7,120
1937	2,081	1,626	1,261	1,150	814	472	305	151	68	21	5	7,954
1947	2,343	1,866	1,401	1,226	956	584	357	152	54	17		8,956

Table 6. Corrected proportional age distributions.

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100 and Over	Total
A. MALES												
1907	2,811	2,049	1,691	1,317	906	1,225						9,999
1917	2,667	2,117	1,673	1,343	905	594	362	219	87	33		10,000
1927	2,667	2,059	1,765	1,404	941	555	347	170	67	21	4	10,000
1937	2,667	2,062	1,599	1,457	1,032	597	344	161	58	18	5	10,000
1947	2,667	2,123	1,593	1,366	1,065	632	359	141	42	13		10,001
B. FEMALES												
1907	2,706	1,995	1,647	1,351	931	1,369						9,999
1917	2,616	2,075	1,643	1,356	915	602	414	224	113	43		10,001
1927	2,616	2,021	1,733	1,407	944	577	386	194	90	25	6	9,999
1937	2,616	2,045	1,585	1,446	1,023	593	383	190	86	26	6	9,999
1947	2,616	2,084	1,564	1,369	1,067	652	399	169	60	19		9,999

10–19 interrupted only by the 1917 proportion which belongs to the above-mentioned large cohort aged 0–9 in 1907. We also notice from Table 3 and Figure 3 that the reported sex ratios (males per thousand females) in the group 0–9 have been practically constant from 1907 to 1947, indicating that the improvement in the age reporting among the females 0–9 was accompanied by a similar improvement among the males. The new sex ratios which result from carrying out the corrections among the females are:

Year	*0–9*	*10–19*	*20–29*
1907	1.103	1.079	.889
1917	1.066	1.068	.886
1927	1.040	1.074	.891
1937	1.026	1.074	.919
1947	1.015	1.089	.930

The downward trend in the 0–9 group is due to the above-indicated downward trend in the proportions of the males 0–9 which has not yet been corrected. If this correction is carried out (by moving the surplus of 1947 into the 10–19 group) the 10–19 sex ratios will increase so much that it will be noticed immediately that there was mis-reporting of those aged 20–29 as being aged 10–19. This erroneous reporting is also reflected by the low survival rates of the 10–19 group and the impossibly high rates of the 20–29 group in Table 4(A).

Therefore there are two necessary corrections in the three age groups under consideration: (a). shifting a proportion of the male population aged 0–9 into the 10–19 group in order to correct for the downward trend in the proportions of the former group, (b). shifting a proportion from the 10–19 group into the 20–29 group to correct for the wrong statement of ages 20–29 as 10–19.

Regarding the first correction, the 1947 proportion will be used again as a basis for correction after modifying it very slightly in order to maintain non-increasing sex ratios in the groups 0–9, 10–19, and 20–29 in 1947. This requires shifting a

Year	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90 and Over
1907	1.047	1.035	1.035	1.035	.983	.981				
1917	1.020	1.020	1.019	1.019	.991	.990	.987	.979	.764	.778
1927	1.011	1.010	1.010	1.010	.989	.988	.954	.870	.734	.817
1937	1.021	1.010	1.010	1.010	1.010	1.010	1.008	.848	.676	.692
1947	1.019	1.018	1.018	1.018	.998	.997	.969	.829	.704	.647

Table 7. Corrected sex ratios.

frequency of 9,000 from the 10–19 group into the 0–9 group. This shift changes the 0–9 proportion to .2667 rather than the reported .2657. As in the case of the females, the excess over this proportion will be shifted from 0–9 into 10–19 for all the censuses except 1907, where it is preferred to allow for the large cohort size by following the same procedure used for the females.

The sex ratios in the groups 0–9 and 10–19 are then recalculated and the corrections in the 10–19 and 20–29 groups are carried out by requiring that, for each census, the sex ratio in the group 20–29 should not be higher than that in the group 10–19. The result of this procedure is to shift certain frequencies from 10–19 into 20–29.

The resulting frequencies, proportions, and sex ratios in the three groups are shown in the first three columns of Tables 5(A), 6(A), and 7 respectively.

One can check on the plausibility of the whole procedure by comparing the new survival rates as given by the first three columns of Table 8(A) with the reported ones [Table 4(A)]. The improvement on the low rates of the 10–19 group and the unreasonably high rates of the 20–29 group is quite obvious.

After carrying out these corrections we have the age distributions given in Tables 5(A) and 6(A) and Figures 4(A) and 5(A). The distributions appear to be reasonably satisfactory, despite the fact that the decennial survival rates of the cohorts 20–29 are still high.

Correction for Under-Estimation of Female Ages 40–59

Going back now to the sex ratios in the groups 30–39, 40–49, and 50-59 in Table 3, we see that these ratios, when compared

Table 8. Corrected decennial survival rates.

Interval	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89
A. MALES									
1907–1917	.852	.924	.898	.777	.741				
1917–1927	.858	.926	.932	.778	.682	.650	.522	.338	.327
1927–1937	.873	.877	.932	.829	.717	.699	.522	.383	.383
1937–1947	.894	.868	.960	.821	.689	.674	.460	.297	.196
B. FEMALES									
1907–1917	.874	.938	.938	.772	.736				
1917–1927	.866	.936	.961	.780	.707	.720	.525	.451	.306
1927–1937	.873	.876	.932	.812	.702	.742	.549	.493	.406
1937–1947	.897	.862	.972	.831	.717	.756	.498	.358	.206

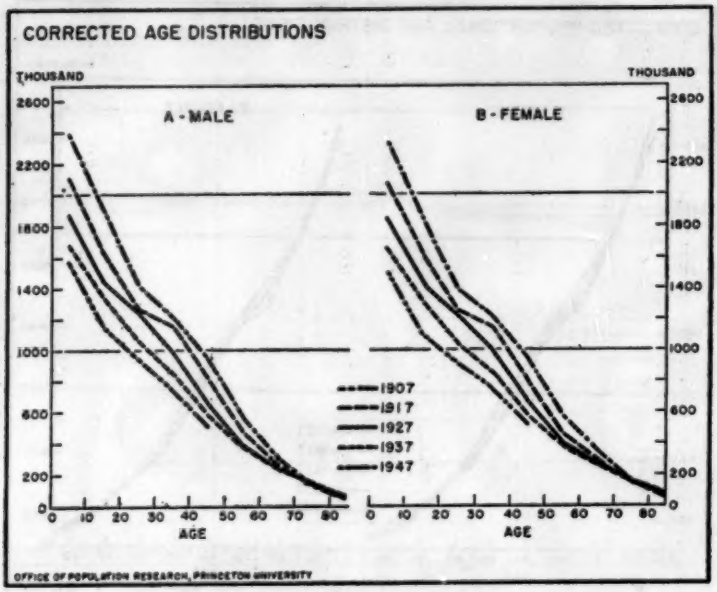


Fig. 4. Corrected age distributions, by sex, 1907–1947.

with those in the group 20–29 as given by column 4 of Table 7, reveal over-reporting of females 30–39 as compared to the males and under-reporting of those in the 40–49 group and, to a smaller extent, in the 50–59 group. This suggests that the trough at age 35 in Figures 1(B) and 2(B) is in fact due to under-estimation of female ages 40–59.

To correct this distortion we are going to satisfy ourselves with the requirement that the sex ratios in the three groups—30–39, 40–49, and 50–59—should not be increasing, and correct the female age distributions accordingly, thus getting the corrected data given in the corresponding columns of Tables 5(B), 6(B), 7, and 8(B) and also in Figures 4(B), 5(B), and 6. Again it should be stated that this correction is incomplete as shown by the fact that the decennial survival rates of the group 20–29 are still high, though more plausible than the reported ones.

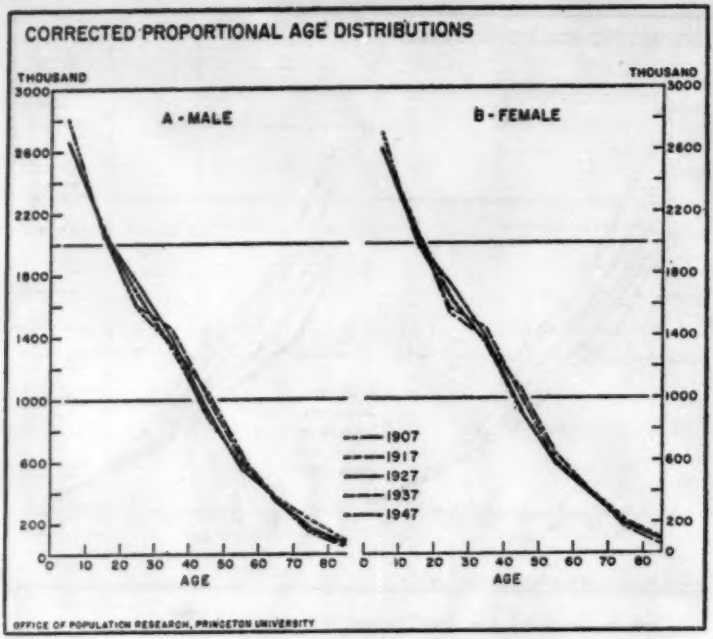


Fig. 5. Corrected proportional age distributions, by sex, 1907–1947.

It is preferred to terminate the corrections at this stage of very essential corrections rather than go further into a more elaborate correction procedure. Regarding the old ages, Table 2 and Figure 2 indicate a systematic improvement over time in the over-estimation of ages 70 and over for both males and females. We can therefore partially correct this over-estimation by adopting the 1947 proportions in the tail of the age distribution starting from age 60. This will be done later when we construct a model age distribution for the interval 1907–1947.

Life Tables for Egypt

Attempts to construct life tables for Egypt started in 1936 when El-Shanawany, (1), constructed the "First National Life Tables for Egypt" for the period 1917–1927. Confronted

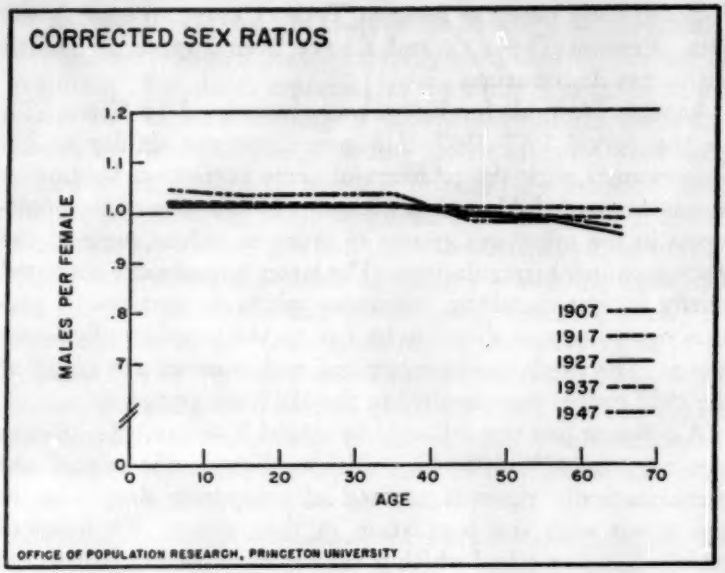


Fig. 6. Corrected sex ratios, 1907–1947.

with unreliable death registration and age reporting at death, El-Shanawany used the method of comparing the age distributions at two censuses, of which the underlying theory is that if P_x^t is the population aged x at time t and if, after an interval of length a, P_{x+a}^{t+a} is the population aged $x+a$ then, in the absence of migration and assuming that P_x^t and P_{x+a}^{t+a} are accurate or subject to the same degree of error, P_{x+a}^{t+a} would be the survivors of P_x^t after the interval t and, consequently, ${}_ap_x$ the probability of surviving a years for an individual aged x would simply be the quotient $\frac{P_{x+a}^{t+a}}{P_x^{t+a}}$. The method has also been applied for the construction of Indian life tables, (4). The application of this method is generally preceded by a process of smoothing the age distributions at the two censuses under consideration because the age distributions under the circumstances where the method is applicable are usually distorted by erroneous age reporting and probably by under-enumeration.

El-Shanawany used the Pearson Type IX curve to smooth the data. Pearson Types IX and I have been applied to Indian census age distributions.

Another life table for Egypt was constructed by Kiser, (2), for the period 1927–1937. His procedure was similar to El-Shanawany's with the addition of some correction for underenumeration of children under 5 and redistribution of the population in the other age groups in order to reduce some of the more prominent irregularities. The latter amendment consisted chiefly in systematically consigning given proportions of persons reporting ages divisible by five to the preceding five-year group. The single-year proportions within every age group of the 1927 census were applied to the 1937 age groupings.

A different line was followed by Abdel Rahman, (3), in constructing the 1936–1938 life tables for Egypt. He applied the mathematically rigorous method of comparing deaths in an age group with the population in that group. He followed mainly King's method which is used in constructing British life tables.

The application of the census differencing method is subject to the drawback that, since the smoothing is done by curve fitting which supplies the "best" possible fit to the distorted census data, the smooth curves may not maintain adequate representation of the correct age distributions, thus giving rise to errors in ${}_{a}p_{x}$ resulting from the estimation errors in P_x^t and P_{x+a}^{t+a} and becoming more serious when the latter errors are in opposite directions. This is reflected in the fact that in the two attempts (1) and (2) the differences between the estimated P_x^t and P_{x+a}^{t+a} were too small in the ages below 10 to give rise to reasonable values of p_x, thus obliging the two writers to discard these estimates of p_x. El-Shanawany, (1), started his life table at age 10 and Kiser, (2), reconstructed ${}_{1}q_{0}$, ${}_{4}q_{1}$, ${}_{5}q_{5}$ from the age-specific mortality rates in the health bureau areas.

The mathematically rigorous method applied in (3), used with various modifications in all countries that have reliable mortality data, has the drawbacks—when applied to Egypt—

of relying heavily on the frequencies and age distributions of deaths and also on a mathematically smoothed census age distribution. The death reporting in the country is far from adequate and varies according to whether or not the areas have health bureaus and also according to the distance between an area and the bureau to which it belongs. To mention an example, the following table is quoted from a report, (5), on a health survey undertaken in a rural area 30 kilometers north of Cairo, comprising a number of villages which are essentially the same in physical and environmental characteristics. The third column in the table gives the crude death rates in the villages in 1948 as calculated from the records of the health bureau and the fourth column gives the death rates in 1951 as calculated from the returns of the survey. The deficiency of the former rates and the dependence of this deficiency on the distance from the bureau are obvious.

Village	Distance from Health Bureau in Kilometers	Crude Death Rates per 1,000	
		1948	1951
Sindbis	0	32	38
Quaranfil	2	19	33
Barada	2	23	28
Aghour El-Sughra	6	12	29

These deficiencies in the death rates would certainly inflate the p_x's and the life expectation in the life table.

The validity of the results of this method also depends upon the accuracy of the age reporting of the deceased which has the same sources of distortion as the census age distribution.

Apart from the above drawbacks inherent in the two methods that have been applied in life table construction for Egypt, the methods have the disadvantage of being techniques which are too elaborate in view of the accuracy of the utilized data. Having in mind that the results of such procedures can at best be approximate when applied to distorted and deficient data, it seems more appropriate to look for a method which is admit-

tedly approximate but at the same time has a simple procedure that suits the quality of the available data. This is the aim of the following attempt which is based upon the approximate stability of the age distributions.

A Life Table Based on the Notion of Stable Population

As pointed out by Lotka (6), if mortality and fertility in a closed population remain unchanged then the age distribution of the population will eventually reach a stable stage, called the stable age distribution, regardless of the initial age distribution and the initial mortality and fertility rates. The proportion of the population aged x will be

$$c\,(x) = b\,e^{-rx}\frac{l_x}{l_o}, \tag{1}$$

where b is the birth rate of the eventual stable population, r is the rate of increase of that population, l_x the number of individuals surviving to age x out of a cohort l_o individuals starting life and going through the mortality experience of the population. In other words, $\frac{l_x}{l_o}$ is the probability that an individual will attain the age x. If the stable age distribution and the rate of increase r are known, then (1) gives the relationship

$$\frac{l_{x_2}}{l_{x_1}} = \frac{c\,(x_2)\,e^{rx_2}}{c\,(x_1)\,e^{rx_1}}, \tag{2}$$

which enables us to calculate the survivors l_x at any age x. Once the l's are available, we can calculate the probabilities of surviving a year for an individual aged x from the relation

$${}_1p_x = \frac{l_{x+1}}{l_x}, \tag{3}$$

and consequently construct the whole life table.

Now since the mortality and fertility conditions in Egypt in the period 1907–1947 remained practically unchanged and since the age distributions during that period were quite similar, and having in mind that the population was virtually "closed,"

we can assume that the age distribution in that period was practically stable and thus use the relationship (2) to construct a life table representing the mortality conditions in Egypt in the same period.[4]

The calculation process will consist of the following steps:

(1). Calculating the stable age distribution. This will be done here by averaging the proportion age distributions which we assume to be approximately stable.

(2). Estimating the proportions c (x) of the population at any desired pivotal points either by simple methods like taking one-tenth of the proportion in a decennial age to represent the proportion at the middle of that group, or taking the average of two adjacent groups as an estimate of the proportion at their mid-point, or by a more refined method of interpolation.

(3). Evaluating the rate of increase r from the populations under consideration. The rates which will be applied here are those calculated for the period 1907–1937 by applying the Malthusian population formula

$$N_t = N_o\, e^{rt} \qquad (4)$$

which gives rates of increase equal to .01165 for males and .01186 for females.

(4). To get the l_x column of the life table, the exponential e^{rx} is then calculated at the pivotal points and multiplied by the estimated c (x) to give $l'_x = \frac{b}{l_o}\, l_x$ at the same points. l'_x at any other desired points can then be calculated by interpolation.

(5). Once we have l'_x we can calculate ${}_ap_x$ from the formula

$${}_ap_x = \frac{l'_{x+a}}{l'_x} \qquad (5)$$

and consequently fill in the ${}_ap_x$ and ${}_aq_x$ columns of the life table.

[4] Lotka mentions on pages 20–22 of his book, (6), three cases where the life table l_x's were multiplied by e^{-rx} and then used to calculate an age distribution which was then compared with the actual age distribution. The procedure followed here is the converse, namely to start with an age distribution and then multiply the proportions by e^{rx} in order to get a life table.

(6). ${}_aL'_x = \frac{b}{l_o} {}_aL_x = \frac{b}{l_o} \int_x^{x+a} l_x \, d_x$, which is proportional to the stationary life table population aged x to x + a is obtained from the l'_x values either by simple averaging or by simple or refined numerical integration. $T'_x = \frac{b}{l_o} T_x = \frac{b}{l_o} \int_x^{\infty} l_x \, dx$, which is proportional to the number of years of life remaining to survivors at age x, can be calculated by summing ${}_aL'_x$ or by numerical integration of l_x.

(7). Finally, the life expectation at age x, $\mathring{e}_x = \frac{T_x}{l_x}$, will result from dividing T'_x by l'_x.

It is obvious that this method can be applied to countries and time intervals only if the assumption of an approximately stable population is justified. This situation is likely to arise in underveloped areas where the high mortality and fertility have not yet started to decrease and where the population does not suffer considerably from epidemics, wars, migration, or other disrupting factors.

The simplicity of the method is also very clear. This is an essential requisite of a method applied to data whose distortions and deficiencies do not justify the application of more theoretically refined methods and heavy calculations. As a matter of fact, given two census age distributions or one census and the growth rate, and even without attempting to correct the distortions in the age distributions, we can very quickly calculate the l_x's and the life expectations at the x's where the age distribution does not appear to be distorted. Going back to the reported census data of Egypt for the decennial age intervals 1907–1947 (Table 2) and calculating the average proportional age distribution without any corrections for overenumeration in 1947, taking these averages as proportional to c (x) at the mid-values of the decennial intervals, giving r the approximate value of .012 for both males and females and taking ${}_{10}L_x = 5 \, (l_x + l_{x+10})$, we get the following rough estimates for l_x's and $\mathring{e}_x$'s at ages 5, 35, 45, and 55:

Age	Males		Females	
	l_x	$\mathring{e}_x$	l_x	$\mathring{e}_x$
5	10,000	42.4	10,000	42.4
35	7,138	25.3	7,242	25.8
45	5,667	20.6	5,512	22.4
55	3,918	17.5	3,943	19.3

which, in spite of the crude and rapid method followed in their estimation, do not differ considerably from those obtained by more elaborate techniques, as can be seen by comparing them with their corresponding values in Figures 7 and 8.

To calculate a complete life table it is necessary, however, to correct the reported age distributions. The corrected age distributions in Table 6 are found adequate, despite the fact that the proportions in the 30–39 group are still high. When calculating the average proportional age distribution it was preferred to use the tail of the 1947 distribution from age 60 upward as the tail of the average distribution in order to utilize what is apparently a systematic improvement in the overestimation of old ages from one census to the next, as indicated before. The average proportional age distributions are as follows:[5]

Age Group	Male	Female
0–9	2,713	2,653
10–19	2,095	2,059
20–29	1,674	1,646
30–39	1,385	1,396
40–49	976	983
50–59	599	611
60–69	361	402
70–79	142	170
80–89	42	60
90–99	10.5	15.3
100 & Over	2.5	3.7
Total	10,000	9,999

[5] In this table the 1947 proportion 90 and over was split between two groups 90–99 and 100 and over according to the average of the ratios between the 90–99 and 100 and over groups in 1927 and 1937.

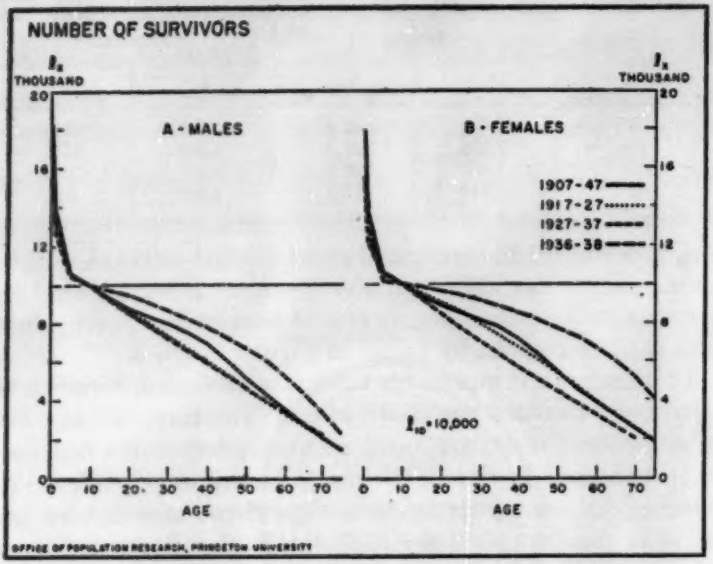


Fig. 7. Survivorship (l_x) values ($l_{10} = 10{,}000$) as given by life tables for Egypt, by sex, selected dates.

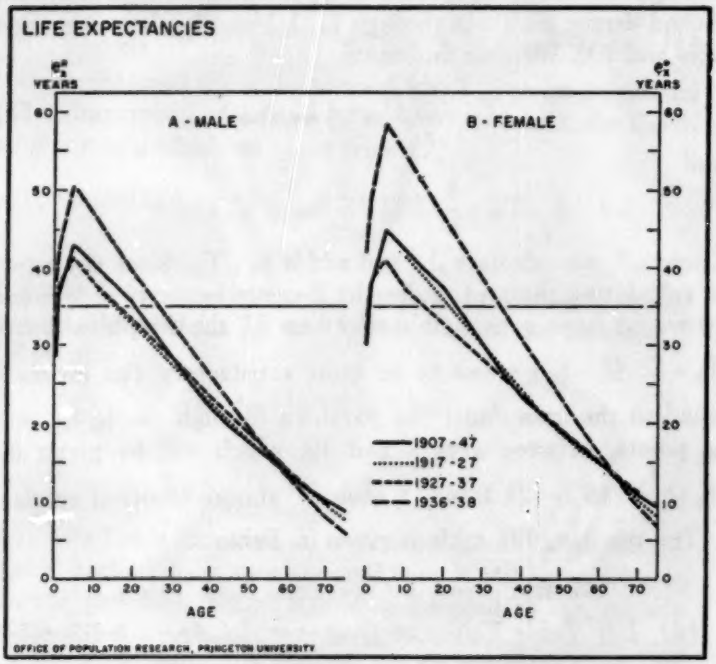
In the calculation of the proportions at the pivotal ages it was preferred, in order to get rid of the inflation in the group 30–39 and at the same time avoid further correction of the data, to estimate the proportion of the population at ages ending with zero by averaging the proportions in the two adjacent age groups. While this method smoothed out the inflation at the mid-value of the 30–39 group, it proved to be as accurate as concentrating the whole proportion in one decennial age group at the mid-value of that group because the l_x curve resulting from the former method was found to be practically identical with that given by the latter method at all ages ending with zero for both males and females. To extend the life table to age 5, one-tenth of the proportion in the first age group (0–9) was taken as an estimate of the proportion at age 5.

The resulting l'_5, l'_{10}, l'_{20}, . . . are transformed into l_5, l_{10}, l_{20}, . . . by taking $l_5 = 10{,}000$ and calculating l_{10}, l_{20}, . . . accordingly. The calculations are as follows:

Pivotal Age x	Males				Females			
	c (x)	$e^{.01186x}$	l'_x	l_x	c (x)	$e^{.01186x}$	l'_x	l_x
5	271.3	1.0599	287.6	10,000	265.3	1.0611	281.5	10,000
10	240.4	1.1236	270.1	9,392	235.6	1.1259	265.3	9,425
20	188.5	1.2624	238.0	8,275	185.3	1.2677	234.9	8,345
30	153.0	1.4184	217.0	7,545	152.1	1.4273	217.1	7,712
40	118.1	1.5936	188.2	6,544	119.0	1.6070	191.2	6,792
50	78.8	1.7905	141.1	4,906	79.7	1.8094	144.2	5,123
60	48.0	2.0117	96.6	3,359	50.7	2.0372	103.3	3,670
70	25.2	2.2603	57.0	1,982	28.6	2.2938	65.6	2,330
80	9.2	2.5396	23.4	814	11.5	2.5826	29.7	1,055
90	2.63	2.8534	7.5	261	3.77	2.9078	11.0	391
100	.65	3.2059	2.1	73	.95	3.2740	3.1	110

From the l_x's we get the ${}_ap_x$'s by consecutive divisions, and hence the ${}_aq_x$'s. T_x for ages between 10 and 70 is then calculated by the approximate Reed-Merrell formula (quoted from (7)).

Fig. 8. Life expectancies as given by life tables for Egypt, by sex, selected dates.



x	Males			Females		
	l_x	${}_ap_x$	$\mathring{e}_x$	l_x	${}_ap_x$	$\mathring{e}_x$
5	10,000	.9392	43.2	10,000	.9425	45.0
10	9,392	.8811	40.8	9,425	.8854	42.6
20	8,275	.9118	35.7	8,345	.9241	37.5
30	7,545	.8673	28.7	7,712	.8807	30.1
40	6,544	.7497	22.2	6,792	.7543	23.5
50	4,906	.6847	18.0	5,123	.7164	19.5
60	3,359	.5901	14.0	3,670	.6349	15.3
70	1,982	.4107	10.3	2,330	.4528	11.2
80	814	.3206	7.9	1,055	.3706	8.6
90	261	.2797	5.2	391	.2813	5.6
100	73			110		

Table 9. Abridged life table for Egypt, 1907–1947.

$$T_x = 4.1667\, l_x + .8333\, l_{x+10} + 10_a \sum_{1}^{\infty} l_{x+10a} \qquad (6)$$

For ages 80 and 90, T_x is taken to be equal to the area under the second degree parabola through l_{80}, l_{90}, and l_{100} between these ages and 100. We thus find that

$$T_{80} = \frac{10}{3}(l_{80} + 4\, l_{90} + l_{100}) \qquad (7)$$

and

$$T_{90} = \frac{5}{6}(-l_{80} + 8\, l_{90} + 5\, l_{100}) \qquad (8)$$

To get ${}_5T_x$ we calculate ${}_5L_5$ and add it to ${}_{10}T_x$. Since the errors in calculating the area under the l_x curve between ages 5 and 10 would have a negligible effect on $\mathring{e}_5$, the simple estimate ${}_5L_5 = \frac{5}{2}(l_5 + l_{10})$ seems to be quite satisfactory (an estimate equal to the area under the parabola through the l_5, l_{10}, and l_{20} points, between ages 5 and 10, which will be given by ${}_5L_5 = \frac{1}{36}(16\, l_5 + 21\, l_{10} - l_{15})$ gave an almost identical result).

The resulting life table is given in Table 9.

Constructing a Complete Life Table

(*a*). *Life Table Values at Quinquennial Ages.* A life table

with five-year age intervals can be readily calculated from the l_x column of Table 9 by interpolating for the l_x's at ages ending with 5. The interpolation is carried out for all ages from 25 through 85 by fitting a second degree moving parabola to four decennial l_x's, two on each side of the required age.[6] The interpolation formula will be:

$$l_{i+5} = \frac{9}{16}(l_i + l_{i+10}) - \frac{1}{16}(l_{i-10} + l_{i+20}) \qquad (9)$$

where $i = 20, 30, \ldots 80$.

To get l_{15} a second degree parabola is fitted to l_5, l_{10}, l_{20}, and l_{25}. This curve gives

$$l_{15} = \frac{2}{3}(l_{10} + l_{20}) - \frac{1}{6}(l_5 + l_{25}) \qquad (10)$$

l_{95} is then obtained by fitting a second degree parabola to the logarithms of l_{70}, l_{80}, l_{90}, and l_{100} which leads to the formula

$$\log l_{95} = -\frac{9}{80}\log l_{70} + \frac{17}{80}\log l_{80} + \frac{33}{80}\log l_{90} + \frac{39}{80}\log l_{100} \qquad (11)$$

Having obtained the quinquennial l_x's, T_x can be calculated for all quinquennial ages from 10 to 90 by means of the Reed-Merrell formula which we quote from (7),

$$T_x = -.20833\, l_{x-5} + 2.5\, l_x + .20833\, l_{x+5} + 5 \sum_{\alpha=1}^{\infty} l_{x+5\alpha}, \qquad (12)$$

and T_{90} and T_{95} are obtained, as before, by fitting a second degree parabola to l_{90}, l_{95} and l_{100} in which case formulas 7 and 8 become

$$T_{90} = \frac{5}{3}(l_{90} + 4\, l_{95} + l_{100}) \qquad (13)$$

and

$$T_{95} = \frac{5}{12}(-l_{90} + 8\, l_{95} + 5\, l_{100}) \qquad (14)$$

(*b*). *Life Table Values at Ages Zero and One.* To extend the life table backward to ages one and zero it is not possible to follow the procedure which has been adopted so far, namely

[6] The results will in fact be identical with those obtained from a perfectly fitting curve because a third degree curve would still give the interpolation formula (9).

calculating $c(x)$ and l'_x and from this p_x and $\dot{e}_x$, because the proportions of children in the first five years of life cannot be calculated accurately from the census data. Kiser, (2), handled this point by calculating ${}_1q_0$, ${}_4q_1$, and ${}_5q_5$ from the vital statistics of the health bureau areas. In Indian life tables, as pointed out in (4), l_x values are projected for ages below 5 by fitting the curve $l_x = A + H\,x + B\,C^x + \frac{m}{nx+1}$.

Owing to the distortions and inadequacies in the data that have to be used for calculating ${}_1q_0$, ${}_4q_1$, it was preferred here to estimate upper and lower limits for these two values. No claim can be made, however, that the following estimates stand far above the level of "reasonable guessing."

In 1946 the infant mortality rates per live birth calculated from vital statistics were .1906 for males and .1834 for females. These rates can be used as minima for ${}_1q_0$ because the under-reporting of infant deaths is heavier than that of births, as indicated by Weir, (5). According to Table 32 of Weir's report, the reported infant rates are deficient by about 26 per cent. If we consider this as a maximum rate of deficiency, since Weir's survey area was utterly rural, we get as maximum values of ${}_1q_0$: .2402 for males and .2311 for females.

To estimate limits for ${}_4q_1$ we had to calculate first ${}_4m_1$ by dividing the deaths 1–4 obtained from the vital statistics of 1946 by estimates of the population 1–4 in the middle of the same year. This procedure gave ${}_4m_1$ equal to .0641 for males and .0607 for females, which we adopt as lower limits owing to the deficiencies in death reporting. To calculate an upper limit of ${}_4m_1$ it is necessary to estimate the degree of under-reporting of deaths in these ages. We have to be satisfied here with an estimate calculated from crude death rates given in Table 32 of Weir's report and belonging to dates before and after his survey. This estimated degree of deficiency amounts to 30 per cent. We then inflate the above ${}_4m_1$ by this percentage to get an upper limit of ${}_4m_1$ which will be .0833 for males and .0789 for females. Finally the Reed-Merrell equation

$$ {}_4q_1 = 1 - \exp\{-4\,{}_4m_1\,(.9806 - 2.079\,{}_4m_1)\} \qquad (15) $$

was used to get the following estimates of ${}_4q_1$

lower limits: .1952 for males and .1873 for females

upper limits: .2359 for males and .2272 for females

The life table is then completed by calculating the limits of l_0 and l_1 which would end in $l_5 = 10{,}000$ after going through the mortality experience expressed by the above limits of ${}_1q_0$ and ${}_4q_1$. The limits of l_0 and l_1 will be:

	Males		*Females*	
	Upper Limit	*Lower Limit*	*Upper Limit*	*Lower Limit*
l_0	17,224	15,351	16,829	15,069
l_1	13,087	12,425	12,940	12,305

Table 10. Life table for Egypt, 1907–1947, by quinquennial age intervals.

x	Males			Females		
	l_x	${}_ap_x$	$\mathring{e}_x$	l_x	${}_ap_x$	$\mathring{e}_x$
0	(17,224)	(.8094)	(31.8)	(16,829)	(.8166)	(33.6)
	(15,351)	(.7598)	(28.5)	(15,069)	(.7689)	(30.2)
1	(13,087)	(.8048)	(38.2)	(12,940)	(.8127)	(40.0)
	(12,425)	(.7641)	(36.4)	(12,305)	(.7728)	(38.1)
5	10,000	.9392	43.2	10,000	.9425	45.0
10	9,392	.9366	40.8	9,425	.9384	42.6
15	8,797	.9407	38.4	8,844	.9436	40.2
20	8,275	.9550	35.7	8,345	.9608	37.5
25	7,903	.9547	32.3	8,018	.9618	33.9
30	7,545	.9412	28.7	7,712	.9488	30.1
35	7,101	.9216	25.3	7,317	.9282	26.6
40	6,544	.8800	22.2	6,792	.8821	23.5
45	5,759	.8519	19.9	5,991	.8551	21.3
50	4,906	.8390	17.9	5,123	.8540	19.5
55	4,116	.8161	15.9	4,375	.8389	17.4
60	3,359	.7880	13.9	3,670	.8144	15.2
65	2,647	.7488	12.0	2,989	.7795	13.1
70	1,982	.6796	10.2	2,330	.7082	11.1
75	1,347	.6043	8.9	1,650	.6394	9.7
80	814	.5848	8.1	1,055	.6265	8.8
85	476	.5483	7.3	661	.5915	
90	261	.5441	5.8	391	.5448	5.8
95	142	.5141	3.6	213	.5164	3.6
100	73			110		

from these values upper and lower limits of L_0 and ${}_4L_1$ (and consequently T_1 and T_0) are calculated by using the Reed-Merrel equations

$$L_0 = .276\, l_0 + .724\, l_1 \qquad (16)$$

and

$${}_4L_1 = .034\, l_0 + 1.184\, l_1 + 2.782\, l_5 \qquad (17)$$

The complete life tables are given in Table 10.

Comments on the Life Table

The main advantage of the procedure which has been applied to calculate the life table values between ages 5 and 100 is its simplicity. A simple technique was utilized to correct the age distributions from the obvious distortions instead of the elaborate techniques of mathematical smoothing which are hard to justify in situations where systematic errors prevail. Once these obvious distortions are corrected, the proportions of the population at pivotal ages are calculated by simple methods and then multiplied by e^{-rt} to give l_x, from which the rest of the life table values will follow.

Nevertheless, a comparison between the l_x and the $\mathring{e}_x$ values of the above tables and the available Egyptian life tables, which are given in Figures 7 and 8, shows clearly that the results of the method we have followed here are similar to those of the census differencing life tables of 1917–1927 and 1927–1937. We naturally have no way of telling which of the life tables is nearer to reality, but the results do establish the fact that the above simple procedure leads to a life table which is not less accurate than those given by the more elaborate methods, thus satisfying the purpose of this work.

The new life table gave reasonable results when it was compared with those of some high mortality populations. Comparison with Mexico in 1930, (8), for example, where the crude death rate was 25.6, showed that the maximum difference between the corresponding life expectancies was about two years between ages 0 and 65, except at ages 5 and 10 where the differences were less than four years. The life expectancies in Mexico were higher up to age 50. Similarly it was found that

the life expectancies of Egyptian males were higher than those of Indian males in 1941–1950, (4), by two years up to age 50, except at ages 0 and 1 where the Indian values were higher than the Egyptian maxima by less than one year. In the case of the females the Indian $\mathring{e}_0$ was about half way between the corresponding Egyptian limits and $\mathring{e}_1$ was less than one year below the corresponding Egyptian lower limit. In the rest of the table the Egyptian expectations were higher than the corresponding Indian values by between 3 and 4.5 years. It must be stated that the purpose of these comparisons is not to prove the validity of the new life table of Egypt but rather to demonstrate that this table falls, when compared with those of other countries, in a position which would be expected on the basis of the mortality situation.

As stated before, the life table values at ages 0, 1 can only be taken as approximations. This is why we thought it was perhaps more plausible to estimate lower and upper limits to those values.

The life table is far from perfect. It will be noted, for example, that the values of ${}_5p_x$ between ages 20 and 30 are high. This is a direct result of the inflation in c (30) caused by averaging the group 20–29 and the over-reported group 30–39 which was not completely corrected in the above correction procedure. In this respect we iterate that our purpose is not to calculate a perfect life table but rather to achieve the maximum possible accuracy on the basis of evidence obtained from the data without resorting to mathematical refinements.

It is also evident that the life table values given in Tables 9 and 10 are high for old ages. This inflation exists in life tables in general and results from over-estimation of old ages. It is dealt with sometimes by replacing the calculated values by extrapolated corresponding values (usually by means of a Gompertz curve). Needless to say, life table values for old ages are hardly trustworthy.

The life tables are taken to represent mortality at any time in the period 1907–1947 because of the above-discussed stabil-

ity of mortality conditions in the country throughout this period. It is possible, if one so desires, to construct a life table based on one census, 1947 for example, and the rates of growth. The resulting life table would not show any real differences from the values given here, except in so far as the difference between the average age distribution that has been used in the above calculations and the desired census age distribution can give rise to. A life table based on the 1947 age distribution was calculated and, as expected, the life expectancies did not differ from those in Table 10 by more than one year. The resulting life expectancies at age 5, for example, were 44.1 for males and 45.9 for females as compared to 43.2 and 45.0 in Table 10.

Birth and Death Rates

The fact that the age distribution of Egypt is approximately stable can be utilized also to calculate the birth and death rates from the l_x column of the life table. This can be seen at once from equation (1), which gives by integration:

$$b = \frac{l_0}{\int_0^\infty e^{-rx} l_x \, dx}, \qquad (18)$$

where the denominator is the area under the $e^{-rx} l_x$ curve, whose ordinates at the ages x given in Table 10 are obtained by multiplying the l_x column by e^{-rx}. The area under the curve is then calculated by simple numerical integration. Once we know the birth rates, the death rates will follow directly from the relation $r = b - d$. In the present case one will naturally get maximum and minimum values of the birth rates by using the maximum and the minimum values of l_0, l_1. The results of the calculations were as follows:

	Maximum	*Minimum*
Birth rate of males (male births per 1,000 males) =	48.1	43.1
Birth rate of females (female births per 1,000 females) =	46.1	41.5
General birth rate (births per 1,000 population) =	47.1	42.3

The general birth rate is a weighted average of the male and female birth rates, the weights being the proportions of males and females in the total of the five censuses 1907–1947.

The maximum and minimum values of the death rates will be obtained by subtracting the rates of natural increase, namely r = 11.7 for the males and r = 11.9 for the females. The results will be:

	Maximum	*Minimum*
Death rate of males (male deaths per 1,000 males) =	36.4	31.4
Death rate of females (female deaths per 1,000 females) =	34.2	29.6
General death rate (deaths per 1,000 population) =	35.3	30.5

The general death rate was calculated in the same way as the general birth rate.

It is interesting to notice that the average reported birth rate in the period 1917–1946 is equal to 42.4, which is almost exactly equal to the above minimum value of 42.3, while the average reported death rate is lower than the calculated minimum by 3.5 per thousand. One could say, therefore, that on the basis of the evidence secured from the reported age distributions and from the above maximum and minimum values the deficiency in birth reporting can be up to 11 per cent while the deficiency in death reporting is between 13 and 31 per cent. One must note, however, that these limits are affected to some extent by the limits we have used before for the infant mortality rate and the death rate in the age group 1–4.

The Net Reproduction Rate and the Mean Length of a Generation

The stability of the age distribution enables us to calculate some measures of the combined effect of mortality and fertility. A first approximation to the net reproduction rate, for example, can be calculated from the approximate relation:

$$b = l_0 \frac{R_0}{L_0}$$

where R_0 is the net reproduction rate and L_0 is the area under the l_x curve of the females and b is the birth rate of the females. This relation gives $R_0 = 1.4$. A thousand women passing through the child-bearing ages are therefore replacing themselves by about 1,400 baby girls. This is equivalent to a 40 per cent increase per generation.

The mean length of a generation, which is the interval during which there has been a relative increase in the female population equal to the ratio between the female births of the two generations, can also be calculated by means of the relation

$$T = \frac{1}{r} \log R_0$$

which gives a mean length of a generation equal to 28.4 years.

Conclusion

The main motive behind this work was to look for simple methods approximating the essentials of the demographic position from data whose distortions and deficiencies do not justify the use of elaborate and detailed techniques.

The approximate stability of the age distribution furnished a useful foundation upon which the whole technique which dealt with various demographic characteristics was based. It was possible by comparing the reported age distributions to spot the obvious distortions and correct them to a reasonable extent without resorting to the more elaborate and probably unjustified methods of curve fitting. It was also possible to utilize the characteristics of a stable age distribution in constructing a life table representing mortality to a reasonable degree of accuracy by means of a simple, quick procedure. In addition, estimates of the crude birth and death rates were readily obtained.

It was even possible to estimate the mean length of a generation and a measure of replacement, namely the net reproduction rate, without using age-specific fertility.

Although the study was confined to Egypt, the technique should be applicable to populations where a stage of approxi-

mately stable fertility, mortality, and migration conditions exists. In the developed countries this stability can only be a past experience which has already been studied and the above methods will only be useful as a simple, rapid technique for obtaining demographic measurements. The main usefulness of the method, however, will be in the underdeveloped areas that have sufficiently stable demographic conditions. There it is hoped that this method will furnish the main demographic measurements with some approximation necessitated by the nature of the available data.

Acknowledgments

The subject matter of this work is the outcome of a series of discussions between the author and Dr. Ansley Coale of the Office of Population Research, Princeton University. Dr. Frank Notestein, Director of the Office, reviewed the work and made several useful criticisms and suggestions. Without holding them responsible for any of the results, I take this opportunity to express my indebtedness to them for their kind assistance.

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ANNOTATIONS

DEPRIVED CHILDREN[1]

AN experimental center for reviewing the needs and making recommendations for proper care of delinquent, maladjusted, homeless or neglected children was established at Mersham in Kent, England, in 1947 with financial support from the Nuffield Foundation and cooperation of Kent County authorities. This was the first center of its type and an early decision was made to assess the value of the work. In the book, DEPRIVED CHILDREN, Hilda Lewis, psychiatrist at the Centre, describes the family and social background and the mental condition of 500 children admitted between 1947 and 1950, and reports the findings of a follow-up study two years after admission for 240 children.

The Mersham Reception Centre was a clearing or sorting station to which the County authorities and the education committee sent the most difficult cases. Twenty-five children were in residence at one time and remained several weeks. Forty-seven per cent stayed three to six weeks, 30 per cent less than three weeks, and 23 per cent more than six weeks, usually because facilities were not immediately available for recommended placement. A complete dossier of every child was sent by the referral agency and supplementary data were collected by the social worker. In the Centre, a daily record was kept of general habits and of social and emotional responses. Each child was given a number of psychological tests and examined by the psychiatrist. The data obtained from these sources, together with material from the follow-up inquiry, are

[1] Lewis, Hilda, M.D.: DEPRIVED CHILDREN. Oxford University Press, 114 Fifth Avenue, New York, N. Y., 163 pp. $1.55.

presented in 71 tables which Dr. Lewis discusses and interprets in an interesting and informative text.

The causes for referral to the Centre give an indication of the family background and previous personal experience of the 500 children whose social adjustment and mental and psychiatric status are studied. The largest group (40 per cent) became public charges because of family neglect, cruel treatment or loss of parental care; 18 per cent were uncontrollable at home or at school; about 25 per cent had a record of delinquency, pilfering or truancy; and about 8 per cent were maladjusted or neurotic children. Furthermore, it was noted that 23 per cent of the children were illegitimate, approximately four times the percentage for the general population.

Classification according to type of behavior by the author after assessment in the Centre resulted in 24 per cent normal, 21 per cent with slight neurotic symptoms, 18 per cent neurotic, 4 per cent psychopathic or psychotic, and 21 per cent delinquent though with essentially normal personality. On the Stanford-Binet test (revised) there was a slight preponderance of dull children, the I.Q. was less than 90 for 28 per cent and 110 or above for 23 per cent.

At time of reception, children were classified as normal (24 per cent), mildly disturbed (31 per cent), and definitely disturbed (45 per cent). Results of statistical tests for association of the child's condition and nineteen features related to the home and upbringing are of interest. Association at the 5 per cent level was found for eleven items: mother's neglect, father's neglect, mother's over-indulgence, father's over-indulgence, lack of mother's affection, mother dull or defective, other mental disability of mother, separation from mother before age 5, previous history of public care, mother long dead or unknown, and dirty home. It is noteworthy that a significantly higher proportion of children from dirty homes than from clean homes was well-adjusted. Likewise, a higher proportion of children neglected by their mothers was normal than of children with attentive mothers; and a higher proportion of children of dull mothers was normal. On the other hand, lack of affection or separation from the mother at an early age was associated with a very high percentage of disturbed children. Over-indulgence

of the mother and of the father also were associated with disturbed behavior of the child.

The pattern of the child's disturbed behavior was classified as unsocialized aggressive, socialized delinquent, and inhibited-neurotic and the association of these patterns of behavior with home and upbringing was examined. Only five of the nineteen items were significantly associated, namely, lack of affection of mother or of father, mental ill-health of mother, illegitimacy, and history of public care. A neurotic disturbance was more likely if the mother was mentally unhealthy; but in the other four instances, the association indicated an increased tendency toward "unsocialized aggressive" behavior.

The follow-up made two years after discharge from the Reception Centre covered 240 children. Of these, 63 per cent had improved in some degree; 29 per cent had not changed; and 8 per cent were worse. Generally, the children placed in accordance with the Centre's recommendations had a better adjustment than those not placed as recommended. Although no type of placement had special precedence, it was noted that the child's adjustment was much better when placement was with parents or relatives. About one-third of the children separated from their mothers before 5 years had a satisfactory condition at this time, contrary to expectations. However, the outcome for those children who at reception showed affection for their parents was better. Children who demonstrated aggression, delinquent behavior, or neurotic conduct at reception, did not fare well. On the other hand, 55 per cent of the children who had come from problem-type families made a good adjustment compared with 24 per cent at reception.

In 1948 the Children Act required that reception centres be established, and in 1950 the Children's Department of the Kent County Council assumed the control and leadership of the Mersham Centre. There were critics. Some thought that a stay at a reception centre was harmful both to the child and parent, and that these social data could best be obtained from an out-patient clinic. Dr. Lewis pointed out, however, that even a protracted stay at the Centre did not disturb the children, that most of them seemed to enjoy their stay, and actually for most of them it carried them over a painful period in a move

from one home to another, to a school, or foster placement home. On the second objection, Dr. Lewis indicated that in such a setting as Mersham, the children could be observed and evaluated better in their social relationships with their peers, siblings, and those in authoritative positions. It was noted that permissive situations were arranged so that the children could display fully all their aggressions, ambivalences, etc. Despite some objections, Dr. Lewis felt that reception centres are necessary with these precautions: retain the child in the home whenever possible, if suitable tests can be administered there; psychiatric facilities at the centre must be adequate; exchange of interagency information; and nonadmission of children under 5 years unless the family situation demands otherwise and then only if adequate facilities and staff are available.

Dr. Lewis is very cautious in drawing conclusions, especially with respect to the effectiveness of the Reception Centre and the adjustment of the children, since only two to three years of a child's life were covered. It would be of interest to know whether these children become useful, productive citizens and make a satisfactory adjustment to the demands of family life and society. Whether the children placed after evaluation in the Reception Centre made a better adjustment than a comparable group not cleared through a Centre was not studied. Such a comparison would permit more definite conclusions concerning the effectiveness of the Centre.

ELISE M. HINKSON

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THE "ONLY" CHILD[1]

ACCORDING to a recent public opinion poll, 75 per cent of the general public and 60 per cent of the Onlies themselves consider "being an only child a disadvantage." The only child has been the subject of more than 200 special investigations. "Unfortunately, the overall results are not conclusive." Most of the studies are vitiated by sampling errors and the findings

[1] Cutts, Norman E. and Moseley, Nicholas: THE ONLY CHILD: A GUIDE FOR PARENTS. New York, G. P. Putnam's Sons, 1954, 245 pp. $3.50.

are conflicting. Drs. Cutts and Moseley, authors of this book, believe that they "have studied more adult Onlies than any other investigator has" and they "do not find that Onlies as a group constitute an unusual class of people." This may be termed the major finding of this "guide for parents and only children of all ages" which in general has subordinated research data and its analysis to the communicating and advice and counsel to "Onlies."

The authors assert that the great majority of only children grow up to be well adjusted adults but that they do not achieve their success without a struggle. The same thing could be said of oldest children, youngest children, and middle children. The authors agree that "the problems which an only child faces are essentially those faced by all human beings. Onliness is at most a complicating factor."

The book can be read at a single sitting. It is unburdened with tables or charts and assumes that the reader doesn't care to question the evidence behind the generalizations made. In describing the special hazards of upbringing, the authors point out that the parents of Onlies are inexperienced, having had no other children to practice on, are statistically older than parents of non-Onlies, are overconcerned with the health of the child, tend to be over-protective, and yet also tend to reject the child as unwanted. The adopted child is particularly likely to be an Only. Parents usually feel guilty over producing an Only and this may make them overindulgent and smother the child with attention. For almost none of these assertions are proportions given which would indicate how frequently these hazards of child rearing were characteristic of Onlies in the groups studied by the authors. Yet the authors had access to 258 case histories of Onlies, 127 Onlies from Mount Holyoke records, 55 Onlies from Vassar, and 34 Onlies from Yale.

Similarly, without providing proof, the authors assert that Onlies are more frequently subject to a number of problems than other children: feeding problems, negativism, temper tantrums, overdemanding-spoiled behavior, attention seeking, submissiveness, deficiency in opportunity to associate with playmates, and more difficulty in achieving autonomy and independence. Yet as adults Onlies are vocationally as success-

ful as other children. The authors state that Onlies are not as likely to marry, and if they marry they do so later and produce fewer children than non-Onlies. They are not quite as likely to be happy in marriage, particularly if they marry other Onlies, but they seem to make good parents and the majority are well adjusted citizens.

Readers of the Milbank Fund *Quarterly* may be interested in knowing that the authors are sufficiently acquainted with the Indianapolis Study to cite its findings on the incidence of unwanted Onlies and the reasons why parents of Onlies stopped with only one child.

REUBEN HILL

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OUR NEEDY AGED[1]

ONE of the interesting social phenomena of our times is the widespread concern with the plight of the aged. Legislative commissions, professional conferences, study and survey projects are everywhere in evidence. Noteworthy among these activities is the report of a recent study of California's efforts over the past several years to deal with the problem of financial dependency among its aged population. The fact that one-third of the persons in the State 65 years of age and over are in receipt of public aid at an annual cost of $218,000,000 seems reason enough for such a study.

The report OUR NEEDY AGED is based upon two years of intensive investigation. It was financed by a foundation grant and conducted under the auspices of the Social Science Research Center of Pomona College. It is a single report presented as an "experiment in cooperative research" by the six social scientists listed as authors. The research team included specialists in population and migration, social psychology and the family, public administration, politics and legislation, taxation and public regulation, and income distribution. The variety of the specialties involved gives some indication of the breadth

[1] Bond, F. A. ; Baber, R. E. ; Vieg, J. A. ; Perry, L. B. ; Scaff, A. H. ; and Lee, L. J., Jr. : OUR NEEDY AGED. New York; Henry Holt and Co., 1954, 401 pp. $6.00.

of the report as well as of the complexity of the issues involved.

Concern for the aged is nothing new in our society, but the problem in recent times has taken on new dimensions. The simple fact that more people than in the past survive the hazards of being born, of growing up, and of living through the vicissitudes of adult life, accounts for the size of the problem. Then added to this is the further fact that there is a gradual increase in the life expectancy after sixty, which alone presents new problems in the areas of medical care, housing, recreation, and family relationships. The report sheds valuable light on these and similar issues. It was found that the proportion of aged in the population is about the same for California as for the rest of the nation—one out of twelve. This may come as a surprise to those who look upon California as a haven for the retired. Actually, the aged comprise a relatively small part of the stream of migrants to this fast growing State. Other findings of interest are that 60 per cent of the aged are over 70 years of age and 30 per cent are over seventy-five. The study also confirmed the well known fact that women on the average enjoy longer life than men and that wives are usually several years younger than their husbands. In California there is even a greater preponderance of women among the aged than for the nation as a whole, the ratio being 83 men to every 100 women.

The report also has some interesting observations on the question of retirement. It was found that as many breadwinners stopped work before age 65 as in the five-year period beginning with the traditional retirement age. Illness and disability account for retirement in more than half of all the cases. Only one person in nine retired because he had enough to live on.

Against such a background of factual information, the report examines in great detail the actual operation of the State's old age assistance program. The California program is unique in many respects. The impetus for an old age pension system had already made considerable headway in California prior to the enactment of the federal Social Security Law in 1935. With the availability of federal grants subject to specific conditions of Title I of this law, the State of California undertook to fashion a security program which retained the "pension" philos-

ophy of a fixed grant (as distinguished from "assistance based on need") and still come within the federal requirements. This resulted in the adoption of liberal policies so far as property and income limitations were concerned and restrictive policies in relation to residence and citizenship. This attempt to reconcile conflicting philosophies has led to much of the State's difficulty in satisfying various elements of public opinion, including the aged themselves. The authors conclude that the present program does not constitute either a *bona fide* old age assistance plan or a sound pension system, because it blurs the distinction between benefits based on contributions and payments based on ascertained need. The report states that Old Age and Survivors Insurance should be recognized as the chief bulwark against economic insecurity in old age and that old age assistance is an essential secondary line of defense and should be "kept such."

Notwithstanding the report's positive acceptance of old age assistance as a program designed to meet the specific needs of older people not otherwise provided for, there appears to be a reluctance to go all the way toward such a goal. The general position as stated appears to be broader than the detailed recommendations. While a so-called "budget" approach is proposed as essential to a program based on need, the study group recommends the retention of a ceiling, now fixed at $80.00 per month and which should not be changed "under present economic conditions." It is difficult to reconcile the notion of a statutory ceiling with a plan based on quality-quantity standards comprising all elements of legitimate need from food to medical care. It has been pretty well demonstrated that in a needs program the best assurance of adequacy and equity rests upon the application of standards geared to an accepted content of living at prevailing prices. With the amount of the grant thus computed, the recipient, of course, should still be free to use the money payment without restrictions. Thus society's obligation to care for the needy is reconciled with the individual's right to manage his own affairs. Other specific recommendations which seem inconsistent with the general recommendation relate to the retention of the present citizenship and residence requirements. One might inquire how a program

based on equity and need can in humanity or logic arbitrarily disqualify thousands of needy individuals because of such arbitrary restrictions?

Throughout the report, there is considerable reference to the problem of unmet health needs and the inadequate provisions for medical care. It was found, for instance, that 14 per cent of the aged on assistance reported "medical care and drugs" as the most important of the unmet needs. The report, however, does not face up to this problem beyond recommending that the present practice of allowing recipients to use outside income, such as OASI payments, for this purpose without reducing the amount of the basic grant. Thus the report leaves unanswered what to do about people who have no outside resources and who do have special needs beyond those covered by the basic assistance payment.

While it is recognized that the scope of the study was not framed to come to grips with all of the social and health problems affecting an aging population, for any student of these problems the study provides a wealth of significant data which any one is at liberty to evaluate according to his own special interest. The shortcomings of the study, if such they are, result from its focus on one segment of a social problem which is much larger than the "care of the needy." The current tendency to equate old age with dependency may subtly undermine the very strength which all social and health programs should seek to preserve.

In using the "age" factor exclusively as a basis for classifying social problems, more fundamental causative factors are overlooked or their importance minimized. Many of the disabilities and handicaps popularly associated with old age are common, in some degree, to all ages. This is not to deny that there is a "slowing-up" process as people advance in years but there is no magic year when people become different from what they were. Every stage in the growth process produces its casualties and much of what we see in the breakdown or helplessness of people in their later years is traceable to the neglect, the tensions and the inadequacies of the earlier years. It is a mistake therefore to assume that dependency or inadequacy are the inevitable penalties of growing old. Such an

assumption leads to an unrealistic isolation of these problems from the total stream of community life and encourages a tendency to play to the weakness rather than to the strength inherent in human personality.

It may already be too late to shift social thinking in this new direction. The concept of retirement at a fixed age has wide acceptance in principle and practice. Besides there is a great sentimental appeal in promoting schemes and programs focused on the apparent needs of older people without too much regard for the social consequences of such activities. The comfortable rocking chair in a charming old folks' home or square dancing at golden age clubs are hardly ideal symbols of effective participation in the business of living. It would seem possible nevertheless to so arrange our social economy that most old people would continue to function as responsible and active members of the community without denying them opportunities for more relaxed living and diversions suited to individual tastes. A study of some of these larger issues seems indicated.

PETER KASIUS

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CULTURAL DIFFERENCE AND MEDICAL CARE[1]

THERE has been increasing recognition in recent years of the contributions which the social sciences can make to medical science. The Russell Sage Foundation has taken an active part in introducing the social scientist into a medical setting, and the value of such inter-disciplinary collaboration is demonstrated by this volume in which a sociologist on a medical faculty discusses the influence of cultural differences upon the utilization of medical services by the Spanish-speaking population of the Southwestern United States.

After an opening chapter in which fictitious case histories illustrate the various medical and social problems existing among the Spanish-speaking group, the author turns to a de-

[1] Saunders, Lyle: CULTURAL DIFFERENCE AND MEDICAL CARE. Russell Sage Foundation, 505 Park Avenue, New York 22, New York, 1954, 317 pp. $4.50.

scription of this population, in terms of its distribution, social characteristics, and degree of acculturation. Three major subgroups are described: the Spanish-Americans, who have lived in the Rio Grande valley for several hundred years; the Mexican-Americans, more recent immigrants from Mexico and their descendants; and the Mexicans, the most recent immigrants, including the large number of "wetbacks."

In a chapter on "The Cultural Chasm" are discussed differences in attitude between the Spanish-speaking group and the dominant "Anglo" society toward such concepts as time, change, work, dependency, and formal organizations. A separate chapter is devoted to the attitudes of the Spanish-speaking population toward illness, their folk medicine with the reasons for its persistence, and their limited acceptance of the medical practices of the "Anglo" population.

Having presented the necessary background material, Dr. Saunders next considers the basic problem with which the book is largely concerned, "how can the influence of cultural . . . differences be reduced so that . . . better health services . . . can be provided for the Spanish-speaking population of the Southwest?" This problem is discussed for both the rural and urban populations, and while it is clear that their low economic level has much to do with the amount and kind of medical care received by the Spanish-speaking group, cultural factors are shown to have considerable influence on the extent to which good medical care is sought and accepted. Included among the more important of these factors which should be considered when providing health services to this population are the very high value placed upon the family and family obligations, the willing acceptance of a dependent status as contrasted with the opposition to this role in much of American society, a dislike of impersonal relationships, and the wide acceptance of folk medicine and its lay practitioners.

In the final chapter, the implications of the preceding discussion for other cross-cultural situations involving medical care are considered. It is emphasized that health services should be adjusted as much as possible to the social structure of the population receiving them. The author concludes with a discussion of biases which are likely to affect medical personnel in

cross-cultural situations. These biases are: the assumption of "a universal human nature which presumably leads all normal people to respond in certain uniform ways in given situations"; an excessive belief in "reason (as) a controlling force in human behavior"; ethnocentrism; identification of scientific medicine with the practitioner's own social organization; ignoring the effect of the social environment upon the patient; and concentration upon the disease rather than the person.

Despite the primary emphasis on the Spanish-speaking group, the approach to the problems of medical care created by cultural differences and the point of view developed in this study should be of interest to all medical workers who deal with patients with a cultural pattern differing in important aspects from their own. Finally, it should be noted that Dr. Saunders has presented his material in a lucid style that is a pleasure to read.

RICHARD V. KASIUS

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COHORT FERTILITY[1]

IT would be true, I think, to say that over the past decade demographers have become increasingly dissatisfied with the measures of population replacement which they have had at their disposal. Of these measures the principal ones have been the gross and net reproduction rates as developed by Lotka and Kuczynski. The obvious superiority of these rates over the cruder measures in earlier use led to their being regarded as the "best" measures of fertility and reproductivity and it is only in recent years that a critical analysis of the limitations of these measures has been undertaken.

The conventional gross reproduction rate is calculated by summing over the child-bearing period the age-specific fertility rates current to the period under consideration. It measures the average number of female babies which will be born to a female living right through her child-bearing period who is

[1] Whelpton, Pascal K.: COHORT FERTILITY: NATIVE WOMEN IN THE UNITED STATES. Princeton, Princeton University Press, 1954, xxv + 492 pp., $6.00.

subject continuously to the rates at which females of each age produce offspring in the period under consideration. Thus the gross reproduction rate for a certain period tells us the rate at which females will reproduce themselves if they are *constantly* subject to the *current fertility conditions* as expressed by the current age-specific fertility rates. The two major objections which can be levelled against the gross reproduction rate defined in this way are:

1. Age-specific fertility rates are not an adequate expression of the "fertility conditions" of a population.
2. The combination of the current fertility experience of females of different ages (i.e. of different generations) is not a meaningful operation.

As far as the first objection is concerned it can be readily appreciated that whether or not a woman will have a child within a given period depends not only on her age but also on her marital status, the number of children she has already borne and the interval since the birth of her last child. It follows that fertility rates specific for age, marital status, parity, and interval since last birth (or since marriage in the case of zero parity females) would more adequately represent fertility conditions than the simple age-specific fertility rates. Indeed if fertility conditions, defined in this refined way, are held constant over a period, the simple age-specific fertility rates (and hence the conventional gross reproduction rate) will almost certainly vary over the period. Thus a marriage boom will, by increasing the proportion of newly married females in the various age groups, raise age-specific fertility rates, even though the underlying fertility conditions have remained unchanged. It follows that if these continue to remain unchanged, the age-specific fertility rates must at a later date fall. Indeed under these circumstances, constancy of the age-specific fertility rates might well imply an impossibly large number of first births in the future. The rate at which females are having first births during the marriage boom could not continue, for if an abnormally large number of women are having their first births *now*, they cannot have first births in a few years time.

This objection to the conventional reproduction rates has been to some extent met by calculating reproduction rates on the basis of more refined definitions of fertility conditions. Thus rates have been calculated which take marital status into account and which have attempted to eliminate the influence of temporary fluctuations in the marriage rate. In the volume under review Professor Whelpton has produced reproduction rates controlled for parity as well as age, so that his fertility conditions are defined in terms of the rates at which females aged x and of parity n produce their $(n+1)$th offspring. These "parity adjusted" rates are discussed in more detail below.

The second objection to the conventional reproduction rates, is more fundamental. In modern societies, the rate at which births are produced, depends mainly on the rate at which people marry and the rate at which married people have offspring *over their married lives.* Since marriage can be postponed or advanced and since many married couples are able, to a considerable extent, to postpone and advance the having of their children, considerable fluctuations in births can take place from year to year without any change in people's attitudes to marriage or family building. It follows that current reproduction rates may bear little relation to the underlying attitudes towards child-bearing, and that reproduction should be measured over the lives of a given generation of females. This is precisely what Whelpton has attempted to do. His cohort fertility rates measure the reproductive performance of a generation of females. Thus the cohort gross reproduction rate for 1905 measures the actual performance over the next 40 or so years of women borne in 1905, whereas the current gross reproduction rate for 1905 measures what that performance would be of a group of women subject to the fertility conditions experienced by all the different cohorts living in 1905.

I have included the above discussion in order to emphasize the importance of Professor Whelpton's book in the methodology of population measurement. COHORT FERLILITY is ostensibly research into the fertility patterns of native-white women in the United States over the past 50 years or so. It contains a mass of detailed statistics and a very detailed appraisal of them. But it would be a pity if the real significance of the book

were lost in the mass of detail. In my opinion Whelpton has shown conclusively that studies of population replacement must be carried out on a generation basis and that the conventional reproduction rates based on current specific fertility rates—however adjusted or refined—have very limited meaningfulness. This has a number of implications. First, it becomes impossible to speak of the current fertility conditions of a particular year, because in any particular year women of child-bearing ages are only part way through their reproductive periods. We can record their child-bearing performances to date, but can only guess what their performances will be when they have completed their reproductive period. In this sense we can never be up-to-date. Secondly, in estimating future populations we should do this on a generation basis also, estimating the future performances of "incomplete" generations. Thirdly, the theory of the stable population and true rate of natural increase as developed by Lotka loses a great deal of its significance. Constant fertility conditions should now, presumably, be interpreted as a constant number of births per generation (i.e. a constant cohort gross reproduction rate). Such constancy is consistent with a variable timing of having children and hence with a variable mean length of a generation. It may also be pointed out here that a permanent decline in the age at which women have their families would result in some acceleration of population growth even if the size of their families remained unchanged.

The practical objective of Whelpton's book is to present statistical material which "can help to advance our understanding of the size of the changes in fertility which have taken place, the extent to which these changes represent short-time cycles or long-time trends, the course of fertility during future years, and the relation between changes in fertility and changes in economic conditions and other phenomena" (page 14). The basic tables presented for this purpose consist of the cumulative birth performance of given cohorts of women, classified by order of birth e.g. 1,000 surviving females born in 1900 will by age 30 have produced 1,803 births (700 first births, 490 second births, 291 third births etc.), and will by age 47 have produced 2,619 births (777 first births, 608 second births, 413

third births etc.). Such tables have never been presented before and their publication (together with the publication of supporting tables) for the United States is extremely valuable and permits of a more detailed analysis of fertility than has been hitherto possible. They are especially useful for examining the extent to which births are postponed or advanced.

Professor Whelpton's analysis throws considerable light on the behavior of fertility in the United States over the past 50 years and on its likely behavior in the future. The conventional gross reproduction rate has shown a steady decline into the 1920's, accelerated in the depression years of the '30's, and a remarkable recovery since about 1940. Has the downward trend in fertility evident since the latter part of the 19th century been reversed? Whelpton is rightly cautious, but his answer seems to be that the downward trend may have been halted, but could hardly be said to have been reversed. The gross reproduction rate of the cohort of 1875 was 1.74 (i.e. females born in 1875 actually produced on the average 1.74 female babies, mortality being ignored). It fell with extraordinary regularity to 1.11 for the cohort of 1909—the last virtually complete cohort available. On the basis of subsequent incomplete cohorts Whelpton judges that a figure of 1.10 will be reached by the cohort of 1910 or 1911 and a limited rise will occur for a time among subsequent cohorts. He also believes that the downward trend in the proportion of married couples having five or more children will continue but that the proportion having no child or one child will also fall and hence will have an offsetting effect. In spite of the fact that the conventional net reproduction rate was below unity throughout almost the whole of the '30's, no actual cohort has failed to reproduce itself. At the same time the baby boom of the '40's can be explained to a considerable extent by the catching up of postponed births and the advancing of future births. This latter phenomenon accounts for the drop in the number of births which Whelpton anticipates will take place in the next ten years. Three sets of projections are provided and although the range between those based on high and low fertility is very wide, they all indicate a fall in the number of births. The calculations involved in making these projections provide an ex-

cellent illustration of how cohort fertility tables should be used in making population projections.

Although the book is mainly concerned with cohort fertility, Whelpton includes a section giving calculations of current reproduction rates controlled for parity, marriage, and fecundity as well as age. In view of the powerful objections which can be raised against reproduction rates based on current data—objections which must for the most part be credited to Whelpton himself—I would not now attach the significance to these refined measures which I might formerly have done. The control in Whelpton's rates for marriage and fecundity is rather arbitrary and he points out that a more refined control for marriage is desirable. However I am puzzled that his refined gross reproduction rates for the years 1920–1949, are, with the exception of one year only, lower than the simple gross rates controlled for age alone. It cannot be due to bias in the allowances for marriage and fecundity, for this allowance works sometimes to increase and sometimes to decrease the refined measure. Whelpton draws attention to this characteristic of his refined measure, but does not attempt to explain it.

Professor Whelpton's book is of the first importance and its influence on the future development of demography will be very great. No one could read it without being impressed by its significance and awed by the detail of its analysis.

P. H. KARMEL

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RESEARCH METHODS IN THE BEHAVIORAL SCIENCES[1]

THIS book represents the contributions of nineteen social scientists from the University of Michigan. In essence, the volume attempts to provide graduate students in the social sciences with a current picture of the level and content of methodology and research methods oriented specifically for the field of social psychology. The editors define the criterion for

[1] Festinger, Leon and Katz, Daniel (editors): RESEARCH METHODS IN THE BEHAVIORAL SCIENCES. The Dryden Press, New York, 1953, xi + 660 pp.

inclusion of methods to be "the degree of relevance to the problems of social psychology, and the criterion for exclusion was the availability of knowledge about a technique already standardized in another field." As this statement suggests, this is not a statistics textbook. A large proportion of the book, in fact, presupposes and requires at least an elementary knowledge of statistics and scientific method. The editors' orientation to the interests of social psychology does not, however, detract from the book's usefulness to some other social sciences, particularly sociology.

Unlike most edited collections of this type, the contributions in this volume are fairly well integrated and of consistently high quality. Following an Introduction by Theodore M. Newcomb, the first section on Research Settings is opened by Angus Campbell and George Katona with a straight-forward and nontechnical description of the sample survey. Special attention is devoted to the variety of research problems for which it is useful and to the usual problems and limitations of the technique. The second chapter by Daniel Katz is a similar treatment of field studies and contains many valuable insights into various problems of research.

The next two chapters will be of interest chiefly to readers in the fields of social psychology or psychology. John R. P. French, Jr., has contributed a discussion of "Experiments in Field Settings" and Leon Festinger has written a description of laboratory experiments in social psychology. In general, the applicability of laboratory techniques to social behavior is still unconvincing at least to this reviewer.

Part II on Procedures of Sampling, consists of one chapter by Leslie Kish. He has produced here a neat description and explanation of the basic principles of sampling and the conventional statistics utilized for estimating sampling error. Kish also includes a description of the different types of sample design and in each instance briefly reviews the practical as well as theoretical problems encountered.

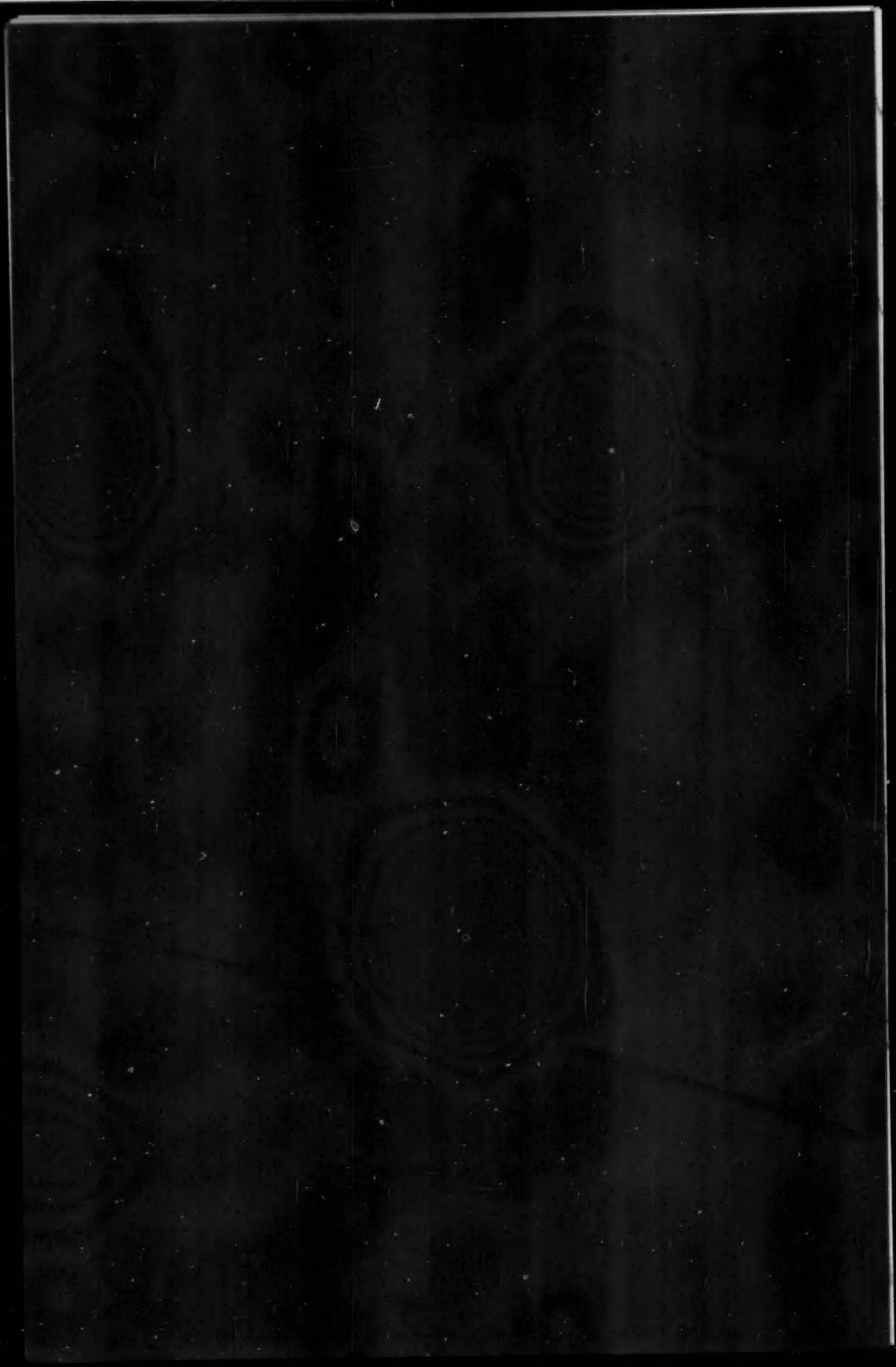
Part III, Methods of Data Collection, is introduced with a chapter by Helen Peak on "Problems of Objective Observation." This chapter will be one of the highlights of the book for the graduate student. Essentially, it is a lucid discussion

of some of the basic problems of scientific observation, such as definition, quantification, validity, and reliability. Especially noteworthy, but equally true of the other chapters, is the nice balance achieved in the relationship of theory and research. The chapter also contains a clear and useful discussion of the differences in the theoretical assumptions of various attitude scaling techniques (notably the work of Thurstone, Likert, Guttman, and Loevinger). The second chapter in this section by Robert C. Angell and Ronald Freedman deals with the use of documents, records, Census materials, and published indices in social research. The usefulness of such sources of data as letters and life histories as well as official registration and enumeration records is evaluated. The section is concluded with two chapters describing two quite different research methods. One by Charles F. Cannell and Robert L. Kahn on the interview is recommended especially for its discussion of the psychology of the interview social situation. The chapter by Roger W. Heyns and Alvin F. Zander is a description of the techniques used for observing group behavior. One difficulty with this latter chapter is the lack of sufficient illustration of the hypotheses which guide this type of research. For the reader with a special interest in group dynamics this would, of course, be no problem.

The fourth section of this book relates to "The Analysis of Data" and includes three chapters that in large measure distinguish this book from similar works. The first chapter by Dorwin P. Cartwright is a good summary of the uses of content analysis (based largely on Berelson's work) and a survey of the variety of studies employing content analysis in one form or another. The primary theoretical concern of the chapter is with the problem of quantifying qualitative material. Techniques of coding a content analysis are described in detail. Clyde H. Coombs in a chapter on "Theory and Methods of Social Measurement" presents a well-organized and thoughtful discussion of the basic logic of the different types of scales and offers a logical basis of classification of methods of collecting and analyzing data. The chapter closes with a comparison of the Guttman and Lazarsfield theories of scale measurement. The final chapter by Keith Smith, "Distribution-free Statis-

tical Methods and the Concept of Power Efficiency" presents a short survey of nonparametric statistics. Brief descriptions of the uses and procedures of the sign test, run tests, median tests, contingency tests and rank-order correlation techniques are included. Actually, too much computational illustration was attempted which because of space limitations could not be developed adequately.

The volume is concluded with a rather lengthy chapter on "The Utilization of Social Science" by Rensis Likert and Ronald Lippitt that draws heavily on the experience of the several social research organizations at the University of Michigan for examples of the practical potentialities of social science and the kinds of problems encountered in dealing with agencies and firms that solicit the aid of the social scientist.

In general, this is an excellent volume that should certainly demonstrate the possibility of a well-integrated book being written by a large number of authors. Much credit for this no doubt belongs to the editors. There is some question as to whether this book should be used as a text but there is no question that it should be required reading for advanced students in the fields of sociology and psychology.

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